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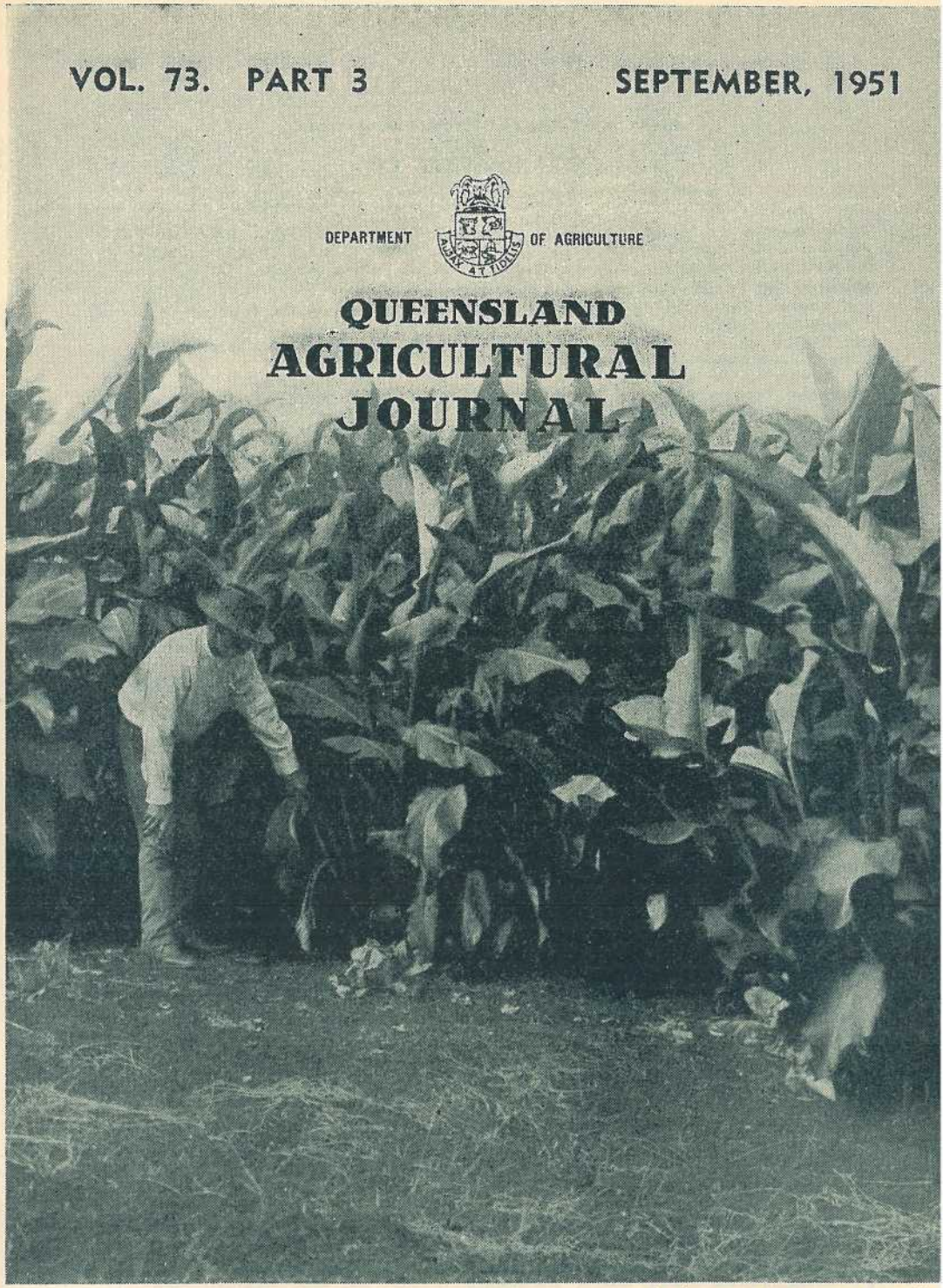

An Arrowroot Crop on the South Coa

LEADING FEATURES

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Contents

Broom Millet.

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(Senior Adviser in Agriculture).

BROOM millet belongs to the non-saccharine types of the group of plants classified as sorghums. The production of heads having long branches which form brushes is the outstanding characteristic of broom millet, or broom corn as it is called in the United States of America. The origin of broom millet is not clear but it is known to have been grown in Europe for more than 300 years.

The long fine branches of the brush or panicle are the commercial portions of the broom millet plant, although the seed threshed from the heads is useful as feed and the stalks have some fodder value as roughage for cattle. Good quality brushes are uniform in size, length, elasticity and toughness and are of a nice bright colour free from blemishes. The brushes are used almost exclusively for the manufacture of various types of brooms.

Broom millet growing is a comparatively minor primary industry in Queensland. In the 1936-37 season, 776 acres were cultivated to this crop, but since then there has been a more or less steady decline, and in 1949-50 only about 200 acres were cropped.

The attitude of farmers in the past has no doubt been considerably influenced by the fact that demand in Australia was limited and the market was sometimes over-supplied by growers in New South Wales. As the crop is grown under non-irrigated conditions, seasonal vagaries have caused fluctuations in yields and returns to growers. Prevailing prices have not been competitive with prices from other primary products and consequently farmers have not exhibited any great interest in expanding acreage in Queensland.

However, the stage has been reached at which supply is much below demand, and if the high average price in 1951 for broom millet brushes (in excess of £150 per ton of fibre) is maintained, there is every indication that very profitable returns can be obtained from the crop.

Soil Requirements.

Broom millet can be grown with some degree of success on a variety of soil types, but for reasonable assurance of good returns, fertile soils, such as the alluvial loams and clay loams (Plate 78), are essential. For best results growth of the plants needs to proceed without check from the seedling stage right through to time of maturity of the brush.

Plate 78.
A Broom Millet Crop at Moogerah, Boonah District.

In the broom millet growing districts, there is a tendency to relegate the crop to sites of lower fertility and to reserve the more fertile areas for such crops as maize, potatoes, onions, lucerne and pumpkins, which, as a rule, are more profitable than broom millet. In common with other members of the sorghum group, broom millet can withstand dry conditions better than most of the crops just mentioned, hence farmers are influenced to sow it on the slopes and poorer soils where other crops will not usually yield profitably. In such soils, however, soil moisture fluctuates more sharply than in the fertile alluvial loams and clay loams; consequently the yield and quality of broom millet brushes produced on the slopes and the poorer soils may vary appreciably from season to season depending on rainfall. There is no doubt that more fertile soils should be selected for the growing of broom millet if its production is to be placed on a really satisfactory basis.

On some farms, however, it may be necessary to sow broom millet on the slopes so that the more fertile soils can be devoted to the production of fodder crops for livestock. In such cases a suitable rotation should be adopted to increase the fertility of the soil on which the broom millet is to be grown, and to improve its capacity to absorb storm rains and retain soil moisture.

In considering suitable rotations it should be remembered that broom millet is a member of the sorghum group of plants and should therefore not follow sorghums or Sudan grass. Root crops and legumes such as lucerne, cowpea and field pea are suitable crops to precede broom millet.

The use of leguminous crops, such as cowpea in the summer and field pea in the winter, as rotation crops on broom millet land is strongly recommended. If practicable it is desirable to plough the whole crop in as a green manure.

Where good land management methods are followed, the chances of obtaining satisfactory returns from broom millet under a wide range of climatic conditions will be greatly enhanced.

Preparation of the Seed-bed.

The methods employed in the preparation of a good seed-bed for the sowing of maize are suitable for broom millet also. Because of the necessity of preventing, as far as possible, any check in the growth of the broom millet plant, all practical methods of building up moisture in the subsoil before planting should be followed.

Where planting is to be done in the early spring, the land should be ploughed in the autumn and left in a rough condition so that the winter rains may be trapped efficiently. Sufficient harrowing and, if necessary, discing should be done through the late winter to control weed growth, and to firm the seed-bed gradually in time for early planting.

For the crop sown in mid-season, the land should be ploughed in the spring and left in a rough state to absorb the rain from early summer storms. Every effort should be made to eradicate weed growth and prepare a weed-free seed-bed, so that the broom millet seedlings will not have to compete with weeds for the available soil moisture and plant nutrients.

Varieties.

The variety of broom millet generally grown in Queensland is White Italian. It is suited to the soils of either the alluvials or the slopes, although there are marked variations in the yields obtained on the two types of soils because of differences in fertility and moisture-holding capacity.

Because of the necessity of producing brushes of high quality to obtain the best possible market price, it is advisable to plant the best seed obtainable. Where it is not convenient for a farmer to select seed from good types for his requirements, it is advisable for him to apply to the Broom Millet Board for his seed.

To maintain a high standard of broom millet, however, it is suggested that the grower inspect his crop before harvesting and select and mark plants showing desirable characteristics, which should be left for seed collection at a later date. In making selections the following points should be kept in mind:—

(*a*) Plants should be healthy with no discoloration on the stalks.

(*b*) Brushes should be of good length, straight, and with even fibres.

(*c*) Colour should be light and even.

(*d*) Seed should be well formed and light in colour.

Planting.

The planting period for broom millet varies according to the district in which the crop is to be grown. It is essential to have fine weather during harvesting, consequently sowings should be arranged so that the crop will be ready for harvesting at a time when weather conditions are likely to be favourable.

In the Lockyer Valley and adjacent districts, where most of the broom millet produced in this State is grown, there are, however, two well-defined planting times—August and September for an early crop, and early December for a late one. Crops planted during these months can generally be harvested in more satisfactory weather than is usually the case with plantings made in other months between these planting periods. Moreover, they have a much better chance of experiencing good growing conditions. Broom millet producers in the Lockyer Valley area should plant the early crop on the higher warmer slopes, and the late crop on the more moisture retentive soils of the lower slopes.

Broom millet is sown with one- or two-row maize planters equipped with plates to sow at the desired spacing of the plants. Usually the rows are spaced 3½ feet apart, but the plant spacing within the rows varies with the time of sowing.

Generally, the rate of sowing is adjusted to produce a stand to suit the soil type concerned and the time of planting so that there is a reasonable chance of a good crop without any thinning of the plants being necessary. As the plants of the early sown crops tend to tiller more than those of the later sowings, a rate of sowing is used in August and September which will space the plants 12 to 15 inches apart. For later planted crops, a heavier rate of sowing, which will leave the plants roughly nine inches apart, is used. The rate of sowing varies from 2 lb. per acre for the early sowing to as much as 5 lb. for the later plantings.

Cultivation.

The usual methods of cultivating maize are satisfactory for broom millet. The maintenance of clean cultivation in a broom millet crop is particularly desirable, as competition with weed growth for moisture and nutrients during any adverse growing periods seriously affects the growth of the broom millet plant. This applies particularly during the stage of development of the plant prior to the emergence of the brushes, for favourable growing conditions are essential then for the production of brushes of satisfactory quality.

Head Bending Operations.

The brush of broom millet grows very rapidly under favourable conditions, frequently reaching a length of 30 inches on fertile soils. The weight of the seed tends to cause the brush to spread out and the fibre may be bent or even broken if there are strong winds, resulting in poorer quality brushes. Any danger of harmful effects on the fibres of the brushes because of the weight of the seed can be largely overcome if the brushes are bent over so that the weight of the seed will keep the fibres hanging straight downward and close together.

The brushes are bent over when the weight of the seed becomes sufficient to cause spreading of the fibres. The operation is done during the hot, sunny part of the day by bending the stalk at a point about 12 inches or more (depending on the height of the crop) below the base of the brush, taking care to bend between the joints or nodes of the stalk. The usual procedure is for the operator to hold one arm up in the air with the wrist against the stalk and with the other hand to bend the stalk down around the wrist, thus preventing the stalk being broken or bent at too sharp an angle (Plate 79).

Plate 79.

Bending Broom Millet Heads by Hand.

This bending operation is a general practice in some broom millet producing countries, such as the United States of America, and could with advantage be practised in Queensland more widely than it is, especially where broom millet is grown on a soil fertile enough to produce a rapid growth of the brushes after good soaking rain. However, the amount and cost of hand labour required is a problem under present day conditions and it is doubtful if the gain in quality obtained by the practice offsets the extra work involved in the bending operation.

Attempts to reduce the amount of hand work have led to the development by a Boonah farmer of a method which is claimed to have given satisfaction. The method consists of rolling down the stalks prior to removing the heads. This operation is very effective and is carried out simply by attaching a fairly heavy pole, long enough to cover four rows, to the rear of a truck or tractor, which proceeds up the central two rows (Plate 80). Some stalks may be partly levelled by the vehicle and the whole row is flattened by the roller. The result is that the stalks and heads are all left lying in the same direction.

This facilitates harvesting and little, if any, damage is done to the heads. Only sufficient rows for the day or half day are levelled so that there is no danger of a sudden storm spoiling the brushes on the ground.

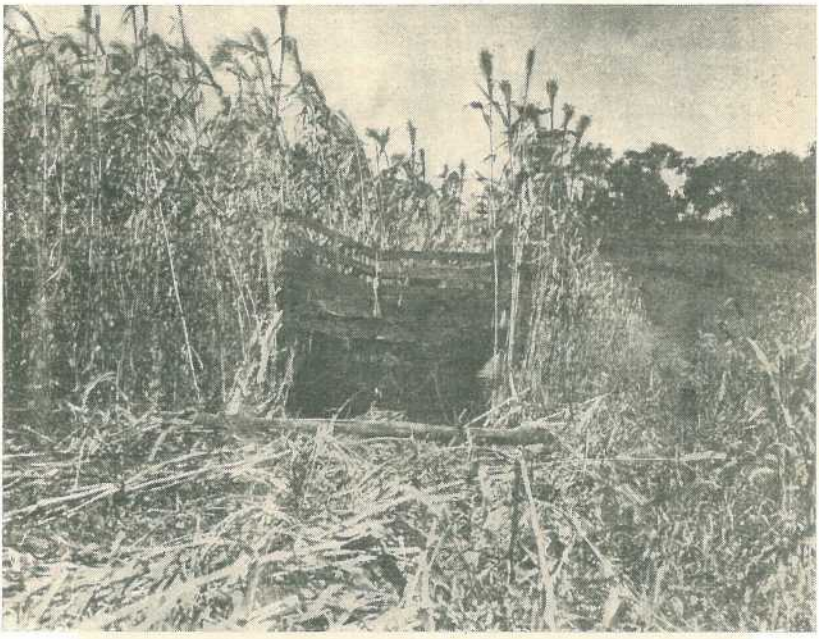


Plate 80.

Rolling Down Broom Millet with a Heavy Pole Attached to a Truck.

This facilitates removal of the heads.

Harvesting.

The best time for harvesting is when the brushes are well developed but while the fibre still has a nice green tinge, though starting to dry out. This stage in the development of the plant is reached before full maturity of the seed is attained, and sound judgment is required to make the right decision as to the suitability of the crop for harvesting.

In some seasons, an excessively wet period may make it necessary to harvest earlier than usual in an attempt to save clean heads that otherwise may be affected by moulds induced by the wet conditions. Again, in crops in which the heads have not been bent over, severe winds may cause splitting open of the supporting sheath of the brush, thus making it necessary to harvest as soon as possible in order to prevent bad distortion of the fibres of the brush. The inexperienced grower of broom millet would be well advised to consult an officer of the Agriculture Branch of the Department or an experienced grower, preferably in his own district, about any of the abovementioned harvesting problems, for by doing so serious losses may be avoided.

In cutting off the brushes, the operator grasps the brush with one hand and cuts through the stalk six inches below the brush with a pruning knife, cane knife or similar cutting instrument (Plate 81). With a little practice it is possible to remove the top of the sheath

Plate 81.
Cutting the Brushes from Rolled Stalks of Broom Millet.

surrounding the stalk below the head at the same time as the cut is made. This allows the brush stalk to dry out more rapidly and makes handling easier. The harvesting should be done on days of bright sunshine in hot, dry weather in order that the curing will be quickly accomplished.

Curing.

For curing, the cut brushes are spread out on a platform or table of stalks, which, after being headed, have been pulled over for the purpose; or, where the rolling down method has been used, on frames erected close to the barn or storage shed (Plate 82). Care must be taken to keep the brushes off the ground so that they may dry out quickly and uniformly. If wet weather threatens, it is necessary to gather the brushes and spread them under cover, as rain may discolour them and cause the development of moulds. Generally, if harvesting is done in hot, dry weather the brushes are cured sufficiently in several days to allow of their being gathered for the removal of the seed.

Where the curing is done under cover, it will be found that the colour and quality of the brushes are better than in brushes cured in the field. The cut brushes are first left in the field for a couple of hours to allow some evaporation of moisture to occur, after which they are loosely stacked, about three inches deep, on racks under cover. They should be turned at frequent intervals to hasten drying out and also to prevent the occurrence of heating in any dense brushes. Where curing is done properly under cover, a tough green brush free of discolouration results; this, if of proper length, commands top prices.

Plate 82.
Sun-curing Broom Millet Brushes.

Removal of the Seed.

The seed of broom millet is removed by holding the brushes against the rapidly revolving studded drum of a machine commonly called a hackler (Plate 83). The studs or spikes projecting from the drum strip or beat off the seed from the fibres without damaging the latter; in using the hackler the drum should revolve away from the operator. Either hand or power-driven machines may be purchased for this purpose.

Plate 83.
Removing Seeds from Broom Millet Brushes with a Power Driven Hackler.
An exhaust fan in the drum on the left removes the dust and trash from the revolving drum. The drum and frame covers were removed before taking the photograph.

Yields.

Yields may vary considerably depending on seasonal conditions and the soils used. Up to 15 cwt. of clean marketable brush per acre may be obtained on good soils but on poor soils 5 cwt. per acre may not be exceeded. Statistics show that the Queensland average is about 5 cwt. of marketable fibre per acre.

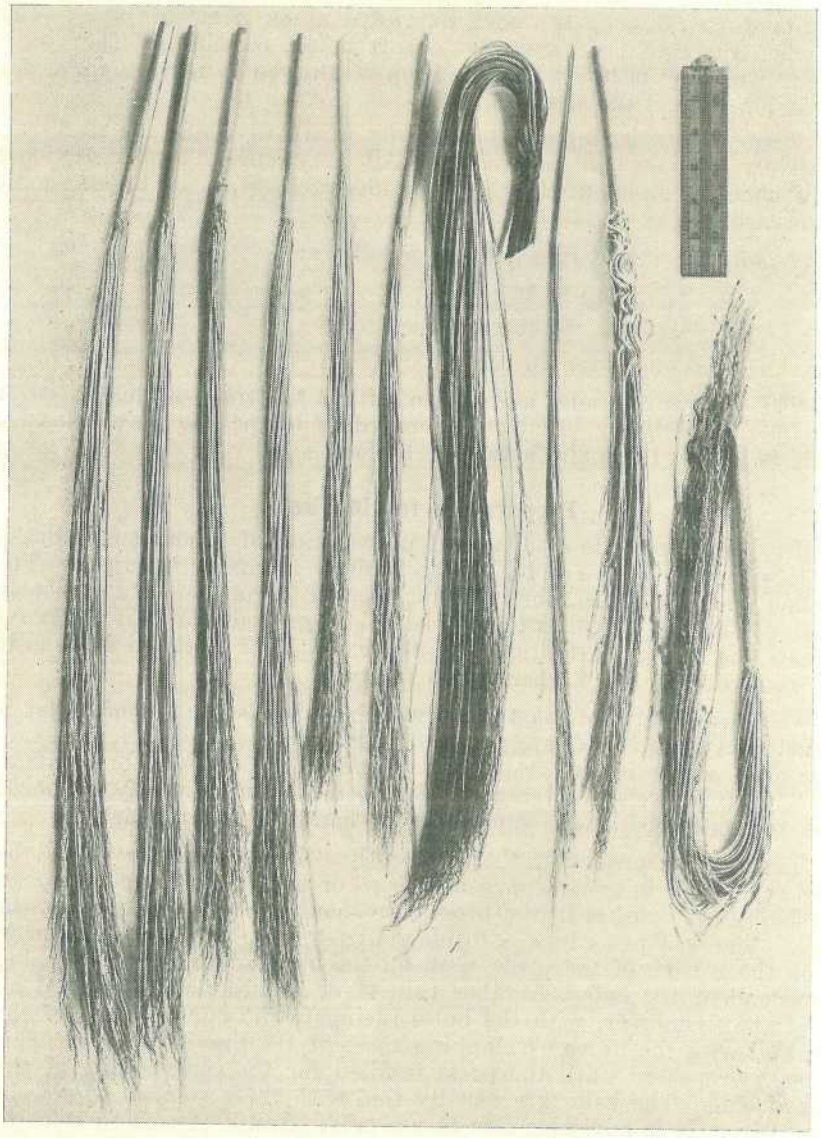


Plate 84.

Good and Poor Types of Brush. In sequence from the left are two brushes classed as hurl, two as covers, two as inside, and four inferior or unsuitable.

Grading.

The classing of broom millet brush into several grades for market is just as important as it is for any other farm product and therefore should not be overlooked by growers. Consideration must be given to trade requirements to ensure that material suitable for manufacturing is marketed.

The sorting of the brush into various grades is a simple, straightforward procedure which is based on colour, straightness and length.

Colour is defined as being green or golden; the former usually results when the crop has been harvested at an immature stage—that is, when the seed is in a milky or soft dough condition. The golden colour normally occurs when the crop is allowed to mature for a few weeks longer and the seed is firmer.

Straightness is important and only brush in which the fibres are relatively straight are acceptable. All very curly, broken, twisted, bent, mouldy, discoloured or other undesirable types of brush should be discarded.

Length is classed into grades as follows:—

(*a*) Short, up to 15 inches;

(*b*) Medium, 15 to 20 inches;

(*c*) Long, over 20 inches.

These various grades are known within the trade as inside, cover and hurl respectively (Plate 84), according to the use to which each grade is put in the manufacture of brooms.

Preparation for Market.

In Queensland the standard of preparation of broom millet brush for market still leaves much to be desired in many instances. The product should not be submitted for sale in an ungraded and poorly baled condition. Brush which is suitably graded and baled always attracts the buyers' attention and the extra work entailed is usually well rewarded by the higher prices received.

Various bales, showing the manner in which some broom millet is marketed in Queensland, are pictured in Plate 85. Unsuitable packages quite often range in size from 40 lb. bundles or trusses to bulky bales of over 250 lb. weight. Irregularly shaped and indifferently prepared bales present considerable difficulties in handling and storage.

The various grades of the differently coloured brushes should be baled separately in an ordinary hay press or in a similar type of press. In placing the brushes in the press care should be taken to protect the fibres. The best procedure is to place first a thin layer of the brushes flat in the bottom of the press, with all the butts of the brushes facing to one end of the bale. Another thin layer should then be placed on top of the first layer, with the butts facing to the opposite end of the bale, and with the fibres overlapping those of the previous layer. This process is repeated until the press is filled for the compressing of the finished bale. The bales are usually tied with three strands of No. 10 gauge wire. It is advisable also to use cross strands of soft tie wire to prevent the two outside wires from slipping off the bale. The size of the bale varies according to length of brush and type of press used, but one 40 inches long, 16 inches wide, and 24 inches deep, weighing from 100 to 112 lb., is very satisfactory for transport and storage.

Plate 85.

Good and Poor Bales. A good bale is standing on the box in the centre; the other bales are poor.

In Plates 86 and 87 are diagrams which illustrate a type of press used for making bales of this size. It can be constructed simply and cheaply from materials usually found on a farm and is easy to operate.

Briefly, the brush is placed in parallel layers in the press in the manner already described and compression is obtained by means of a lever manually operated in a see-saw fashion by two persons, the fulcrum bolt being lowered as the bulk is compacted.

When the material is sufficiently pressed, the three No. 10 gauge galvanized tie wires are placed in position and fastened. The completed bale is finally removed by unhinging the outer side of the press.

Marketing.

All broom millet produced in Queensland is required to be marketed through the Broom Millet Marketing Board. This Board, which operates under the *Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1946, was originally constituted on 11th March, 1926, and has been in continuous operation since that date.

The Board itself does not handle the commodity, but has appointed as selling agents State Produce Agency Pty. Ltd., Brisbane, and Denham Bros. (Rockhampton) Pty. Ltd., Rockhampton. Growers must consign their broom millet to one of these agents, who, after deducting

5 per cent. of the proceeds of sales to cover the Board's administrative expenses, and a further 5 per cent. for agent's commission, remits the net proceeds direct to the growers. Bales are required to weigh no more than 1 cwt. each.

Each season, the Board requires a return to be completed by all growers, setting out the acreage planted and the expected crop. The Board normally sends forms for completion to all known growers, and in addition advertises its requirements in certain newspapers which circulate in the main broom millet growing areas. Generally, these forms are required to be returned during the month of February.

Anyone contemplating growing broom millet who wishes to obtain any further information on marketing should address communications to The Manager, Broom Millet Marketing Board, C/- Council of Agriculture, 369 George street, Brisbane.

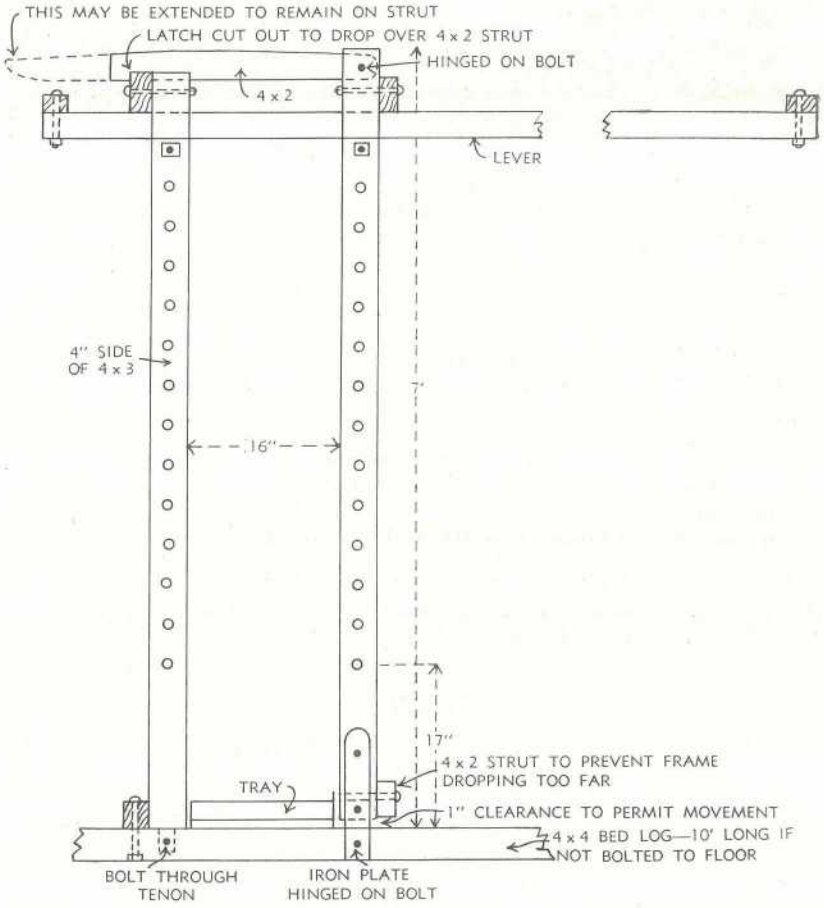


Plate 86.

Diagram of a Broom Millet Press (end view).

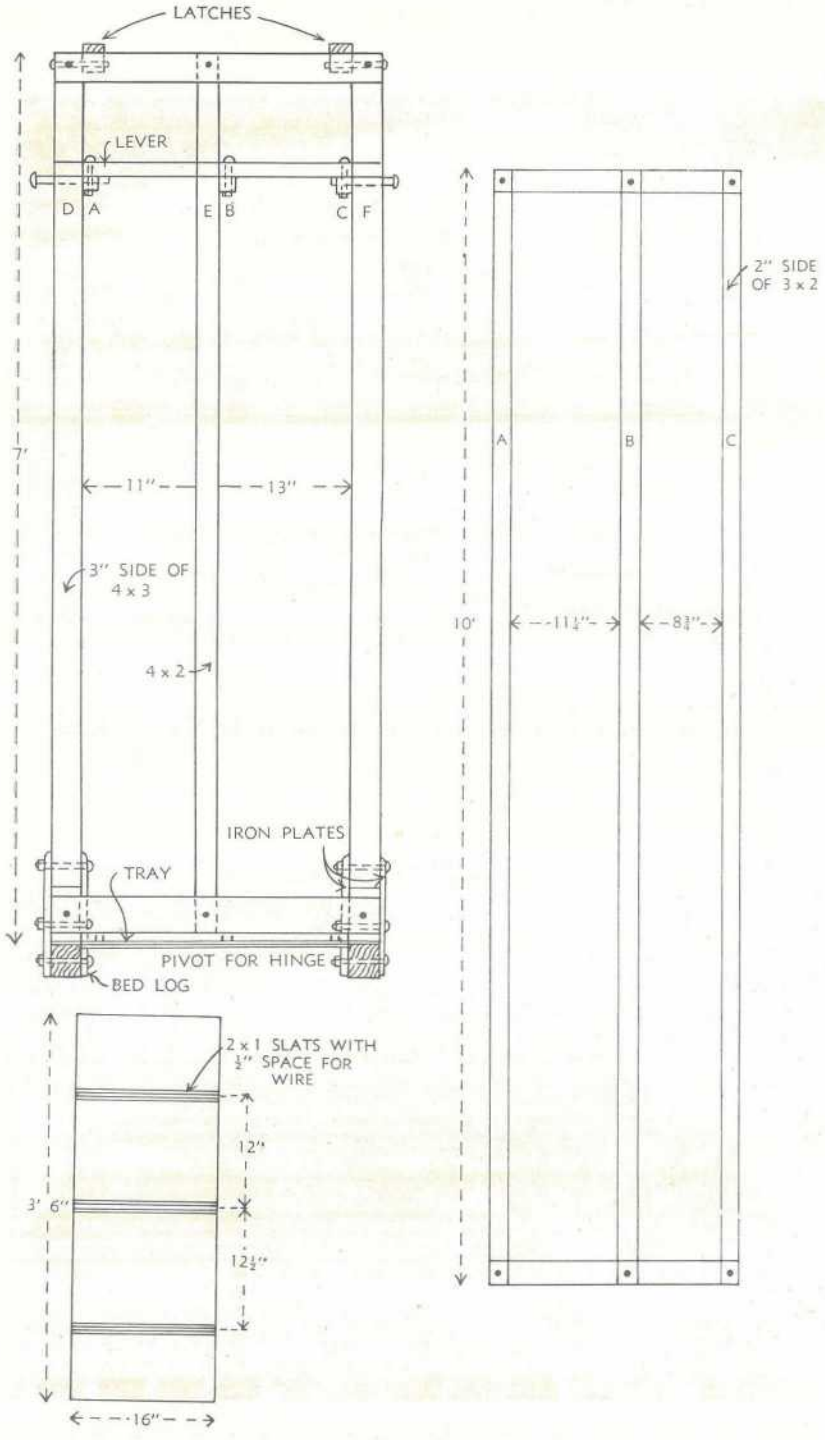
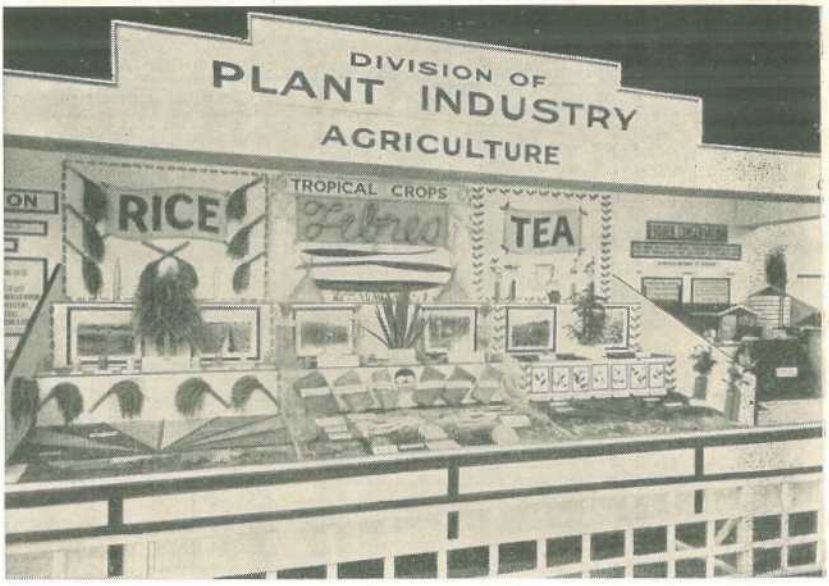
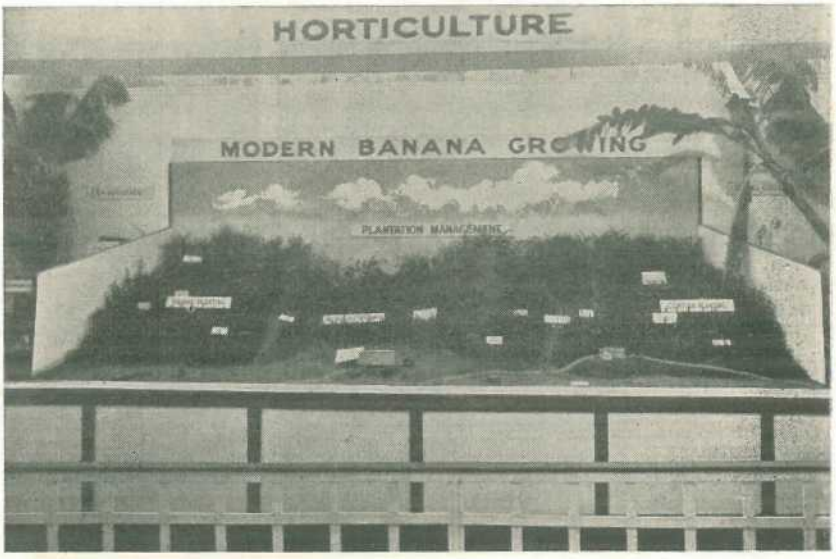


Plate 87.

Broom Millet Press. Top left, side view; bottom left, tray; right, lever.



The Department's Investigational Work With Rice, Tea and Tropical Fibres was Attractively Portrayed by the Agriculture Branch at the Brisbane Show.



Plantation Management was the Theme of the Horticulture Branch's Display at the Brisbane Show. Contour Planting, the Use of Hormones in Eradicating Old Stools, and the Reconditioning of Old Land were Featured.

Horticultural Districts of Queensland.

8. The Dry Tropical Zone.

S. E. STEPHENS, Horticulturist.

UNLIKE most horticultural districts of Queensland, which are compact and closely settled, the North Queensland district extends over several hundreds of miles with many widely separated centres of production. The huge area automatically divides itself into two districts with distinctive rainfalls, and the more southerly of these may be termed the dry tropical zone. This zone extends from Bloomsbury, some distance south of Proserpine, northward along the coast approximately 200 miles to Bambaroo, and westward some 200 miles to Hughenden (Plate 88). The area includes the river systems of the Don, the Burdekin, the Haughton and the Ross, and also several islands off the coast, the most important of which from a horticultural aspect is Magnetic Island.

PRODUCTION CENTRES.

Bowen, with its outlying settlements at Longford Creek, Guthalungra and Gumlu, is the largest and most closely settled centre of horticulture. The Burdekin delta gives first place to sugar cane growing but horticultural crops are grown also by many farmers. Townsville is a newly developing horticultural centre of small crops for local consumption. Magnetic Island is devoted to pineapples and mangoes. In the area known as the Ingham Line, there are a number of small farming groups adjacent to railway sidings along the railway between Townsville and Bambaroo.

Away from the coast the settlement of Woodstock lies at the foot of the coastal range west of Townsville, while over the range farther west are Charters Towers and Pentland, where citrus, grapes and vegetables are grown under irrigation.

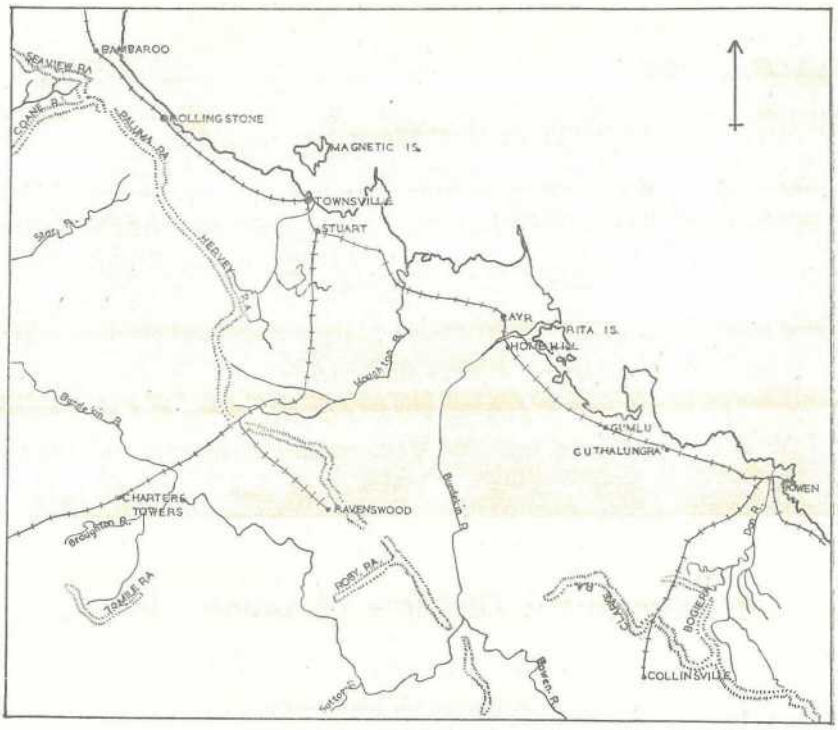


Plate 88.

Sketch Map of the Dry Tropical Zone.

HISTORICAL RECORDS.

Besides being the largest horticultural centre of the district, Bowen holds the distinction of being the first town established in North Queensland. The settlement was founded in 1861 to provide a port for the then newly settled grazing lands of north-western Queensland. After a few years, however, Cleveland Bay was found to offer better facilities and a ready accessible port and Townsville was established on Ross Creek in that bay in 1865. Townsville is now the port for the north-west, and its importance is as a port rather than as a horticultural centre. The population now exceeds 34,000 and the city, therefore, provides a market for the more perishable fruit and vegetable crops that are being produced on a limited scale in the immediate vicinity.

Bowen has developed along rural lines. As the soil near the town was almost uniformly fertile, the land has been subdivided into small areas for close farming settlement and, as climatic conditions permitted the production of crops at periods when shortages existed in other districts, farming development was able to proceed with the assurance of a market for the produce. Even before Bowen was connected with southern markets by rail, a large fruit and vegetable export trade by sea through the port of Bowen to Sydney had been built up. Some years ago, however, rail transport superseded sea transport.

Of the other coastal centres, the Burdekin delta developed from grazing to sugar cane growing and for some years limited quantities of fruit and vegetables have been grown, often as sidelines to cane.

On the Ingham line, horticulture has been a companion industry to sugar cane, as on most farms small cane assignments left the farmers with surplus land upon which other crops could be grown to increase the yearly income. Magnetic Island is chiefly a tourist centre but a fairly extensive pineapple industry was built up from modest early plantings for the local market when it was found that the harvest season corresponded with a season of shortage on southern markets.

The inland centres of Charters Towers and Pentland were developed originally as grazing districts and are still such primarily. Gold was discovered at Charters Towers in 1872, and a few years later on the Cape River at Pentland. For some years gold mining was the major occupation of a population exceeding 30,000. As has been the case in many other rural districts of Queensland, Chinese gardeners saw the opportunities for horticultural production that such a population presented, and demonstrated the horticultural possibilities of the area. With the decline of mining, a number of people turned to horticulture. The establishment of a number of secondary schools and other institutions in the city of Charters Towers maintained a good local market and horticulture has continued to flourish.

TABLE 1.

CLIMATIC DATA FOR DRY TROPICAL ZONE.

—	Jan.	Feb.	Mar.	Apr.	May.	June.
Mean Maximum Temp. (°F.)						
Bowen	87·8	87·5	85·4	82·9	79·7	76·2
Townsville	86·9	87·0	86·2	84·1	80·4	76·6
Charters Towers	92·3	90·6	88·6	85·8	81·1	70·5
Mean Minimum Temp. (°F.)						
Bowen	75·1	74·5	73·1	69·5	63·3	59·3
Townsville	75·8	74·9	73·4	69·6	64·2	60·8
Charters Towers	70·9	70·2	68·2	63·0	57·4	53·1
Average Rainfall (in.)						
Bowen	10·4	8·8	5·8	2·8	1·3	1·6
Townsville	11·4	11·4	7·4	3·5	1·3	1·3
Charters Towers	5·7	4·5	3·9	1·6	0·8	1·3

—	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average.
Mean Maximum Temp. (°F.)							
Bowen ..	75·2	77·1	80·5	83·7	85·8	87·8	82·6
Townsville ..	75·5	76·8	79·7	82·5	84·5	86·2	82·2
Charters Towers	76·3	79·7	85·0	90·3	90·5	94·4	86·2
Mean Minimum Temp. (°F.)							
Bowen ..	56·5	58·5	63·0	68·4	71·7	73·9	67·2
Townsville ..	58·4	60·4	65·3	70·5	73·5	75·6	68·5
Charters Towers	50·9	53·3	58·1	62·9	67·3	69·2	62·0
Average Rainfall (in.)							
Bowen ..	0·9	0·7	0·8	1·1	1·3	4·4	39·9
Townsville ..	0·6	0·5	0·8	1·4	1·8	5·4	46·9
Charters Towers	0·6	0·6	0·7	0·7	1·4	3·5	25·3

CLIMATE.

Although lying well within the tropical zone, the coastal portion of the district has a climate characterised by moderate summer and mild winter temperatures. Winter frosts are experienced at times but they are not common and are only infrequently of sufficient severity to cause extensive injury to crops. The south-east trade wind, which is the prevailing wind on the coast over the greater part of the year, is at times sufficiently strong to cause some injury to crops planted in exposed situations.

The inland areas are subject to a greater variation between summer and winter temperatures than is the case on the coast. Summer temperatures are frequently high, while the winter minimum temperatures can be expected to reach and sometimes descend below freezing point.

Annual rainfall in all parts of the district is relatively low for the tropics, and as the greater portion falls during the months of January, February and March, irrigation is a necessity for successful horticultural enterprises. The average annual rainfalls for three representative centres in the district are Townsville 47 inches, Bowen 40 inches and Charters Towers 25 inches.

Table 1 shows the mean maximum and minimum monthly temperatures and the average monthly rainfalls for the stations of Townsville, Bowen and Charters Towers.

VEGETATION.

The influence of the long periods of dry weather each year is reflected in the natural vegetation. Open hardwood forest prevails throughout the district. In coastal areas the predominant trees are eucalypts—bloodwood and Moreton Bay ash on the better drained lands, and poplar gum on the more retentive soils. On lowlying areas that tend to become swampy, almost pure stands of paper-bark tea-tree occur.

The Bowen vegetation differs from the general coastal vegetation types, for inland species encroach on the coastal plain. The prevailing eucalypt is grey box, and such western plants as gidyea and prickly acacia are common. Ironbark is common on the ridges.

In the Charters Towers-Pentland area grey box on the flats and ironbark on the ridges is the general rule, but trees of Burdekin plum and of species of *Acacia, Flindersia,* and *Wrightia* are frequent in these stands.

SOILS.

The greater part of the soil under cultivation throughout the area is of alluvial origin; some areas are very old, others more recent, while some are still being built up with fresh deposits left by floods every year or two. The seasonal flooding is a feature of the great Burdekin River, whose extensive watershed extends northward into the high rainfall tropical zone. The Don, the Haughton and the Ross rivers also are subject to flooding in only slightly lesser degree than the Burdekin, but as they are comparatively short the flooding is usually less extensive.

Magnetic Island and some of the soils on the Ingham line are of decomposed granite. These require careful husbandry for the maintenance of their humus content and they are liable to become very hot when exposed to the summer sun. Regular green manuring to increase the organic matter, and cropping to give the greatest shading of the soil, should be routine procedures.

As a general rule, the soils are slightly acid to slightly alkaline in reaction. Most of the areas under crop are suitable for horticultural crops without the addition of lime, except in cases where prolonged cultivation with the use of acid fertilizers and irrigation has increased acidity. Many of the areas devoted to pineapple growing are nearer a neutral reaction than is desirable for this crop.

Zinc and copper deficiencies are prevalent in some crops in inland areas and corrective treatments must be applied at frequent intervals. In coastal areas, the deficiencies are less pronounced but symptoms can usually be observed in the more susceptible plants.

Nitrogen is almost without exception the outstanding deficiency in cultivated lands and the regular use of nitrogen-rich fertilizer mixtures is considered desirable on most crops.

IRRIGATION.

With nine months out of the year dry by horticultural standards, irrigation is an absolute necessity for the production of most crops, and particularly so for vegetable crops that are chiefly grown during the winter and spring months and for such fruit crops as bananas, papaws, citrus and grapes that set and mature crops during the dry months. The delta lands of the coastal area are usually well provided with underground water held in gravel beds at depths ranging from about 15 to 30 feet. The water flow is so free in the Burdekin delta that it is possible to operate centrifugal pumps of up to 12 inch suction diameter from a nest of spears driven into the gravel bed.

Not all water in the delta lands is suitable for irrigation. Several defined areas are known to have saline water underlying them, while certain others are liable to intrusion of brackish water during dry seasons.

At Charters Towers and Pentland, irrigation water is drawn from streams. The cultivated land is invariably an alluvial soil adjacent to creek or river banks. However, the water level is below the dry sandy bed during the period when irrigation is necessary and the texture of the sand is usually such that it is desirable to enclose the intake pipe of the pump in a cylinder of concrete or some other material. As the streams become turbulent during the wet season, it is customary to have the cylinder roofed over and to place it well below the surface of the sand for protection.

HORTICULTURAL CROPS.

Bananas, pineapples, mangoes, papaws, citrus fruits and grapes are the most important fruit crops of the district, and tomatoes, cucumbers, marrows, cabbages and melons the chief vegetable and annual crops.

Bananas.

The banana grows very well on some of the heavier alluvial soils of the Burdekin delta where freedom from frost and protection from winds can be obtained and where irrigation facilities are ample. Fruit quality and size of bunch produced are excellent and plantation life is well above the North Queensland average. The dwarf variety Cavendish is most favoured as it is most easily protected from wind damage.

Pineapples.

Pineapples (Plate 89) are at present produced in greatest quantity and concentration at Magnetic Island, but the Bowen area also has a number of pineapple farms scattered through it. Further expansion on Magnetic Island is limited by the rather small amount of additional suitable land available. The transport difficulties associated with marketing from an island also constitute a considerable handicap to expansion. At Bowen, on the other hand, more suitable land is available although the prevalence of nut grass and danger of frosts limit the choice to some extent. Marketing facilities, however, are good. The Burdekin delta and Ingham line are small producing centres at the present time but both offer good scope for development.

Plate 89.
Smooth-leaf Pineapples at Bowen. This is a plant crop in fruit during October.

Until recent years the Common Rough variety held pride of place in commercial plantations because the fruit was popular on northern markets. The Smooth Leaf variety was grown on a very limited scale to extend the harvesting season, but the sale of the fruit was always considered doubtful. As exports to southern fresh fruit markets increased, however, the area under the Smooth Leaf has increased and recent plantings contain a higher proportion of that variety. The establishment of processing plants in North Queensland is influencing the change to the Smooth Leaf variety and only the shortage of planting material is retarding the transition.

Mangoes.

Mangoes (Plate 90) as orchard plantings are chiefly concentrated in the Bowen area where "Kensington" is the favoured variety. This fibreless variety of good colour, flavour and texture was first developed as a commercial variety by the late Mr. H. G. Lott and is now widely

planted for export. Although the variety was developed at Bowen the largest single planting of Kensington mango has been made at Ayr, where an orchard of 1,000 trees exists. Magnetic Island grows mangoes on a smaller scale but possesses several orchards of mixed plantings of fibreless varieties, some of which are of high quality. In the city of Townsville householders and public authorities all grow mango trees, some of a good variety but many of mediocre to poor quality. The crops are bought annually by certain enterprising persons and placed on local and southern markets, but variety, quality and grade are often very mixed in market consignments.

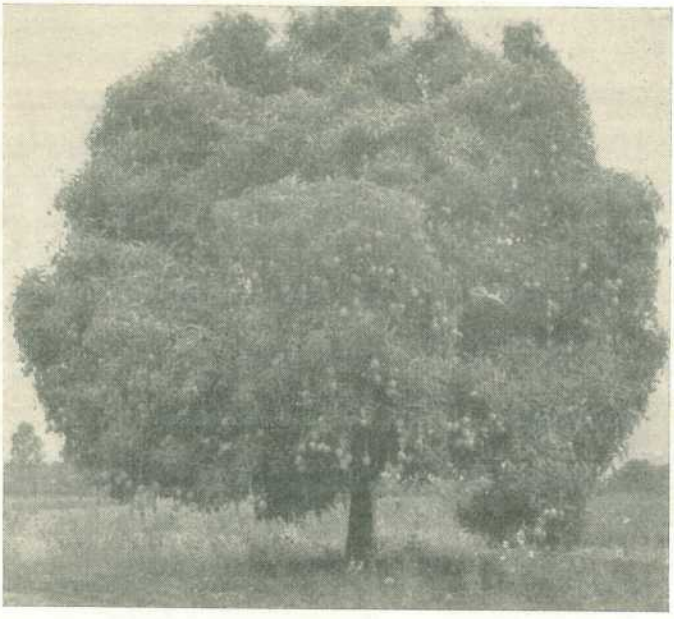


Plate 90.

The Kensington Mango, the Main Commercial Variety in the Dry Zone.

The climate in the greater part of the coastal section of the dry tropical zone is particularly favourable for the mango, as rain rarely occurs during the flowering season and consequently there is seldom much loss or injury from diseases. The harvesting season for the crop usually extends from November to January.

Papaws.

Papaws are grown throughout the coastal section but not on a large scale. The plant can be found in almost every home garden and the local fresh fruit market for commercially grown papaws is therefore very limited. The crop is subject to considerable damage from wind in exposed positions. In the Burdekin area good results are being obtained by growing papaws in the shelter of sugar cane crops.

Yellow crinkle disease destroys some plants every year and at intervals of a number of years causes extensive destruction of plants. However, as the papaw has a relatively short commercial life of only about three years and commences cropping in less than one year, such periodic outbreaks of disease cause only a very temporary decline in papaw production.

Citrus.

Commercial production of citrus fruits is almost entirely restricted to the inland areas of Charters Towers and Pentland, but, as with the papaw, many householders in all parts of the district have one or more trees in their gardens. Oranges grown commercially are chiefly the varieties Washington Navel, Joppa, and Valencia Late (Plate 91),

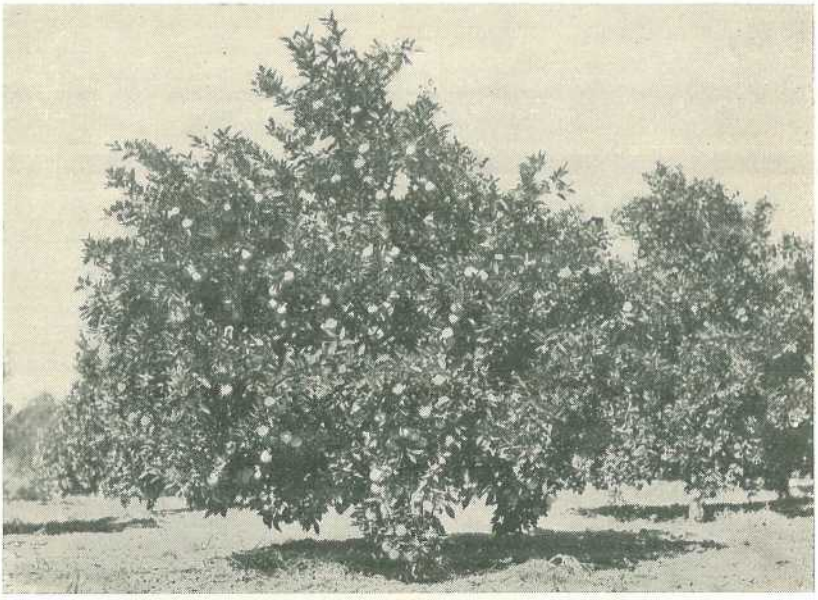


Plate 91.

Valencia Late Orange, the Chief Variety Grown at Charters Towers.

the range giving a harvesting season extending from April to December. The Valencia Late constitutes almost half of the total orange plantings. Jaffa is grown to a limited extent, more successfully at Pentland than at Charters Towers. Emperor, Ellendale Beauty and King of Siam are the mandarin varieties most generally grown and they are favoured in that order.

Lemons and grapefruit are not grown extensively. The lemon ripens the greater part of its crop during the winter months when the demand for this fruit is at its lowest. Grapefruit are not yet sufficiently appreciated by the public of the north for any extensive market to be available locally.

Close attention to the maintenance of soil moisture is the most important aspect of citrus growing at Charters Towers and Pentland. With high summer temperatures and low relative humidity, transpiration is excessive and failure to maintain a sufficient reserve of moisture in the soil soon leads to the decline and death of the tree. This is well illustrated by the rapid collapse of trees that have been abandoned for a short time.

The customary method of irrigation used is the furrow and basin system in which water is led along a furrow between the tree rows and emptied into basins under each tree. The basins are enclosed by an earth bank about four to six inches high under the outer limits of the tree spread. It is customary to run the water to the farther end of the furrow so that the most distant trees are irrigated first, and then to work back along the row, diverting the water into the basin under each tree. If the land is not reasonably level or has an uneven gradient the water is carried by pipes to positions from which furrows with the required fall can be made. Pipes are also used at times to carry the water across depressions intersecting the furrows.

Fertilizing is necessary to maintain the vigour of trees. Present practices are not standardised but it is customary to use a soil dressing of some kind annually. In the past, some growers have made a regular practice of spreading municipal compost through the orchards and this has done much to maintain the fertility of the soil. The present tendency, however, is to use commercial fertilizer mixtures and some growers supplement these with an additional dressing of sulphate of ammonia in the spring months. In this area, crops of up to five bushels of oranges may be harvested from four-year-old trees, so the necessity for feeding the trees is apparent. The regular use of the trace elements zinc and copper is desirable to maintain tree vigour. Twig dieback and leaf mottling are very conspicuous in orchards where the practice is not adopted.

Fruit fly and larger horned citrus bug are the chief insect pests attacking the fruit. Both cause considerable loss at times. Termites or white ants frequently attack the trees, entering through the roots and working up the trunk and into the branches; boring the trunk and poisoning with an arsenical poison is the control method usually adopted.

Grapes.

The same inland areas of Charters Towers and Pentland are the grape growing districts, and the crop is usually grown in conjunction with citrus fruit on similar soils and with similar cultural methods. The variety Royal Ascot appears particularly suitable to the conditions in the area. It is hardy and of vigorous growth, with good foliage. The fruit has a reasonably tough skin and most of the crop ripens before the end of December, thus escaping much of the storm rains that are liable to cause heavy losses in late maturing grapes. Snows Muscat and Black Muscat Hamburg are grown to a much less extent than Royal Ascot because, although the fruit has a better flavour, the vines are not so robust and the fruit is more susceptible to rain injury.

In trials conducted some years ago at Charters Towers, the variety Servant was found to be suitable for the district. However, it has an amber coloured berry which is less attractive to the general public than the black grapes, flavour and quality notwithstanding.

The common irregularity of winter conditions may cause the vine to break into new growth in early August. It is necessary, therefore, to prune during late July. However, frosts are liable to occur during August so there is always some risk of frost injury during the early spring. The certainty of a market for the crop in northern centres with no risk of competition from other producing districts makes the risk worth taking.

Tomatoes.

The tomato constitutes the greater part of Bowen's horticultural production. Between 1,500 acres and 2,000 acres are planted to this crop annually and fruit in the vicinity of half a million half-bushel cases is marketed, chiefly between the months of May and September. The bulk of this production goes to interstate markets and is harvested and marketed in mature-green condition. A proportion of the crop colours between pickings and, as no local market for this fruit is available, it is discarded in the field as waste.

Tomatoes have been grown extensively at Bowen for many years and Fusarium wilt is a major disease in the area. Wilt resistant varieties of tomato are, therefore, necessary. Farmers have bred their own wilt resistant variety and this is planted to the exclusion of almost all others. The variety (Plates 92 and 93) is known as the Bowen Globe and various local growers have selected strains with the characters considered best for their conditions. The Bowen Globe is a vigorous plant with the main arms reaching 10 to 15 feet, dense laterals and foliage, and well shaded fruit. The fruit is of good size, globe shaped and ripens to a pink rather than the bright red colour of other varieties grown in the State. Yield per plant is heavy and harvesting from the one crop extends over several months.

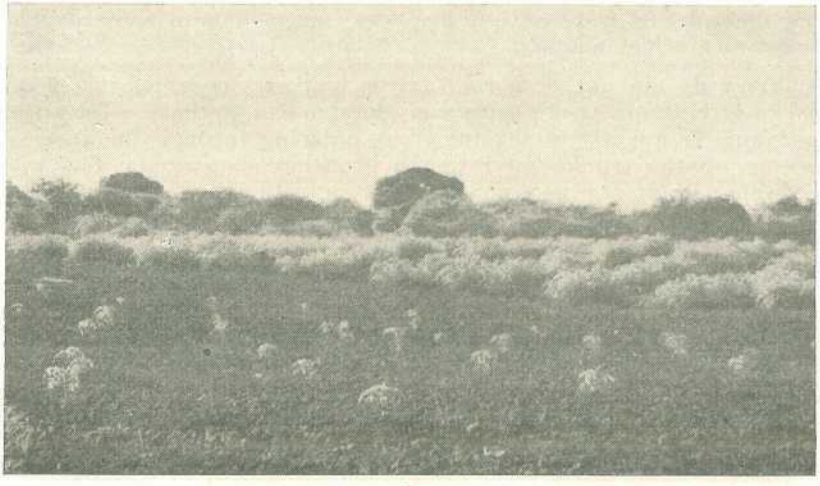


Plate 92.

Bowen Globe Tomatoes. Note the wide spacing of young plants in the foreground.

As the crop is grown during the dry period of the year, irrigation is essential. Both spray and furrow systems (Plate 94) are used, the choice of method depending mainly on the individual farmer's preference. Intelligently used, both methods give good results.

Winter tomatoes are also produced in the Burdekin delta for interstate markets, the variety grown and the cultural methods adopted being similar to those at Bowen. Charters Towers, Woodstock and some areas north of Townsville cultivate the crop on a much smaller scale for local markets only.

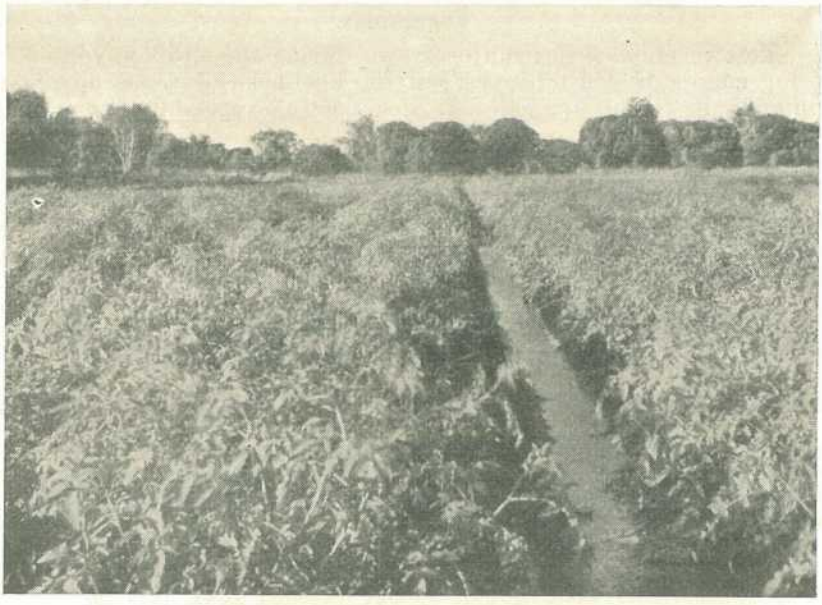


Plate 93.
Bowen Globe Tomatoes at the First Pick. Note the wide ground cover.

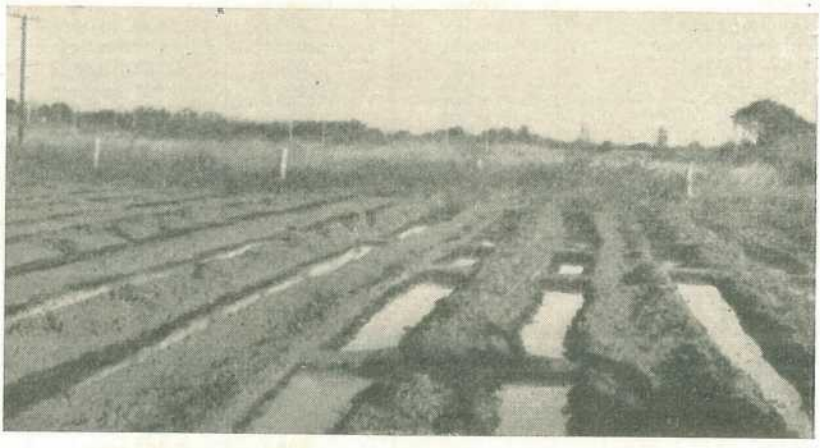


Plate 94.
Furrow and Check Bank Irrigation of Small Crops at Bowen.

Melons.

Watermelons are grown for local markets at practically all producing centres. Kleckley Sweet, Klondyke and Cuban Queen are grown fairly generally, and Irish Grey, which is tough skinned and of good carrying quality, is also favoured by Charters Towers farmers.

Rock melons are grown for southern export at Bowen and harvested during the period from October to December. Rocky Ford and Hales Mildew Resistant are popular varieties.

Vegetables.

Most vegetable crops can be grown during the autumn, winter and spring months in coastal areas, but the likelihood of frosts during the winter limits the production of frost-susceptible vegetables at the inland centres.

The more perishable types are grown only in sufficient quantity to supply local requirements, but the cucurbits—cucumbers, marrows and pumpkins—are produced in exportable quantities in coastal areas. They are grown through the late winter months for a spring and early summer harvest, when a satisfactory market is usually available.

PRODUCTION AND MARKETS.

The area under crop and the approximate production during the year 1949-50 are shown in Table 2. As Townsville is the only city of any appreciable size in the district, much of the produce must be exported to other centres. A weekly fruit train running to a fast schedule permits the marketing of the bulk of the Bowen production and a considerable portion of that from the Burdekin Delta on Brisbane and interstate markets.

TABLE 2.

HORTICULTURAL PRODUCTION—DRY TROPICAL ZONE, 1949-50.

FRUIT.

Crop.	Not Bearing.	Bearing.	Production.
Citrus—	Trees.	Trees.	
Navel oranges	400	807	836 bushels
Valencia oranges	3,421	5,022	8,099 bushels
Other oranges	1,834	4,099	5,764 bushels
Mandarins	979	2,490	3,643 bushels
Limes and lemons	421	668	939 bushels
Custard apples	242	390	742 bushels
Mangoes	3,795	10,863	31,327 bushels
	Acres.	Acres.	
Grapes	7	21	60,658 lb.
Bananas	25	62	4,852 1¼ bush. cases
Pineapples	27	206	27,538 1¼ bush. cases
Papaws	6	15	2,539 bushels

VEGETABLES.

Crop.	Area.	Production.
	Acres.	
Potatoes	529	2,595 tons
Sweet potatoes	15	34 tons
Turnips	5	39 tons
Carrots	9	895 tons
Tomatoes	1,602	389,035 ½-bush. cases
Beans (French)	24	1,248 bushels
Peas	7	217 bushels
Cabbages	44	8,528 dozen
Cauliflower	6	796 dozen
Lettuce	2	315 bushels
Melons	82	199 tons
Pumpkins	852	1.156 tons
Marrows and squashes	8	9 tons
Cucumbers	122	7,713 bushels

Local fresh fruit markets are not large and no produce agents operate in any centres except Townsville. In the smaller centres sales are by direct contact between grower and retailer or consumer. A considerable market of this kind exists in the western district of the State and is exploited fairly extensively by growers of the Charters Towers and Pentland areas.

Local markets for processing are available at Townsville and Cairns, and growers desiring to do so can direct certain crops to the Brisbane canneries.

PROSPECTS.

The future of horticulture in the district depends on the markets available. In the past the prosperity of the industry had depended upon the fact that production of some crops has been possible at periods of the year when other districts were unable to grow those crops. However, new varieties, advances in horticultural knowledge, and modifications in horticultural practice are extending the season of production of these other districts so that overlapping is now occurring. The dry tropical zone is at a disadvantage on its distant markets in regard to both marketing costs and lack of freshness of its products after several days' transport to reach the market. The present distant markets for fresh fruit are, therefore, unlikely to offer much scope for future expansion, or indeed to continue as sound as they have been in the past. Future prosperity and expansion would appear to be linked with development of local outlets created by the recent establishment of processing plants in North Queensland. These plants should do much to stabilise horticulture in the district.

JUNIOR FARMERS' ORGANISATION.

Keen disappointment was felt at the cancellation of the Junior Farmers' boys' "camp," which was to have been held at this year's R.N.A. Jubilee Exhibition, and also the A.B.C.'s annual "leadership" contest for girls, due to the prevalence of polio throughout the State.

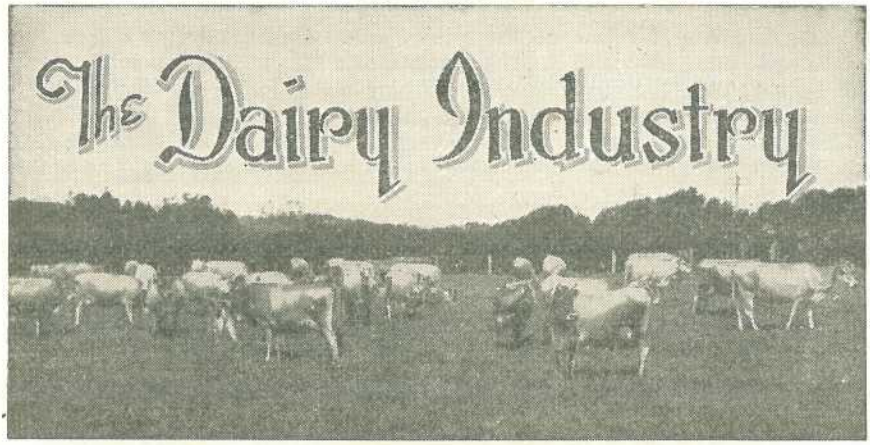
However, arrangements are being made to hold the girls' contest in November next, provided conditions improve to such an extent as to make the holding of the competition possible. The State Director (Mr. T. L. Williams) has been advised to this effect from the Sydney office of the Australian Broadcasting Commission, and also that any of the original 12 contestants selected for the August competition will still be eligible in November, despite the fact that they in some cases may have attained the maximum age limit (21 years) in the meantime.

Girls therefore still eligible for the 1951 "leadership" contest, if available, are as follow:—Lenore Saal (Allora club), Gwen. Jones (Clifton), Margaret Davis (Chinchilla), Doreen Rose (Gayndah), Elaine Chapman (Bauple), Edna Zischke (Murgon) or Thelma Kerkow (Wondai), Beverley Robertson (Monto), Joan Hurley (Tully), Mary Pelligrin (Goondi, near Innisfail), Olive Renton (Eton North), Fay Kennedy (Goovigen) and Margaret Maltby (Bowen).

TUBERCULOSIS-FREE CATTLE HERDS.

(AS AT 20th AUGUST, 1951.)

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus ..	The Scottish Australian Company Ltd., Texas Station, Texas F. H. Hutton, " Bingegang," Dingo
A.I.S...	F. B. Sullivan, " Fermanagh," Pittsworth D. Sullivan, " Bantry " Stud, Rossvale, *via* Pittsworth W. Henschell, " Yarranvale," Yarranlea Con. O'Sullivan, " Navillus Stud," Greenmount H. V. Littleton, " Wongalea Stud," Hillview, Crow's Nest J. Phillips and Sons, " Sunny View," Kingaroy Sullivan Bros. " Valera " Stud, Pittsworth Reushle Bros., " Reubydale " Stud, Ravensbourne H. F. Marquardt, " Chelmer," Wondai W. G. Marquardt, " Springlands," Wondai A. C. and C. R. Marquardt, " Cedar Valley," Wondai A. H. Sokoll, " Chelmsford," Wondai
Ayrshire	L. Holmes, " Benbecula," Yarranlea J. N. Scott, " Auchen Eden," Camp Mountain "St. Christopher's and Iona " Studs, Brookfield Road, Brisbane
Friesian	C. H. Naumann, " Yarrabine Stud," Yarraman J. F. Dudley, " Pasadena," Maleny
Jersey	W. E. O. Meier, " Kingsford Stud," Rosevale, *via* Rosewood J. S. McCarthy, " Glen Erin Jersey Stud," Greenmount J. F. Lau, " Rosallen Jersey Stud," Goombungee G. Harley, Hopewell, Childers Toowoomba Mental Hospital, Willowburn Farm Home for Boys, Westbrook F. J. Cox and Sons, " Rosel " Stud, Crawford, Kingaroy Line R. J. Browne, Hill 60, Yangan P. J. L. Bygrave, " The Craigan Farm," Aspley A. Verrall and Sons, " Coleburn Stud," Walloon R. J. Crawford, " Inverlaw Jersey Stud," Inverlaw, Kingaroy P. H. F. Gregory, " Carlton," Rosevale, *via* Rosewood E. A. Matthews, " Yarradale," Yarraman A. L. Semgreen, " Tecoma," Coolabunia G. & V. Beattie, " Beauvern," Antigua, Maryborough L. E. Meier, " Ardath " Stud, Boonah
Guernsey	C. D. Holmes, " Springview," Yarraman



The Care and Operation of Milking Machines.

J. D. ELRINGTON and E. B. RICE, Division of Dairying.

THERE are estimated to be 13,000 milking machines in use on dairy farms in Queensland, and this number is being constantly increased as the scarcity of farm labour and other economic factors force farmers to depart from the hand milking of dairy cows.

It is clear from investigations and the practical experience of many farmers that the yield of milk and butterfat, the persistency of lactation and the health of the dairy cow are not detrimentally affected by machine milking, provided the machine is maintained in efficient condition and good machine milking practices are adopted.

High quality milk can also be produced consistently by machine milking if recommended cleaning and milking procedures are followed.

Milking machines may be broadly grouped into *releaser, bucket* and *independent unit* types. All that is needed for efficient machine milking is a simple machine with stable vacuum and regular pulsation, and correct training of the cows. The special "gadgets" fitted to many machines are quite unnecessary. It is, of course, necessary to supply some form of motive power for the milking machine, and this usually takes the form of an internal combustion engine or electric motor. A power unit of 1-1½ h.p. usually suffices for the machine alone, but as it is general practice to separate while milking, a 3 h.p. engine is recommended. This gives sufficient reserve power to operate additional equipment, such as lighting plant and skim milk pump.

RELEASER-TYPE MACHINES.

A releaser milking machine consists of the following parts:—

1. Vacuum pump.
2. Vacuum tank.
3. Vacuum gauge.
4. Relief valve.
5. Pulsators.
6. Teat-cup assembly.
7. Releaser.
8. Sundry metal and rubber tubes, sight bowls, &c.

Vacuum Pump.

By drawing air out of the pipes, the vacuum pump creates the partial vacuum essential to the operation of a milking machine. It has been found that the "effective displacement" of the vacuum pump has a most important bearing on the efficiency of milking. In practical operation "effective air flow" is governed by the size and efficiency of the pump, the amount of leakage in joints, pulsators, &c., and the sensitivity of the relief valve.

A piston pump was formerly used on milking machines, but it has now been displaced by the rotary vacuum pump. There are various designs of pump but the principle of operation does not differ.

Plate 95 shows an interior view of a common type. It consists of an external cylinder or case enclosing a rotor which is set "off centre." The rotor contains two blades separated by two pins and two coil springs. The rotor assembly is supported in ball bearings.

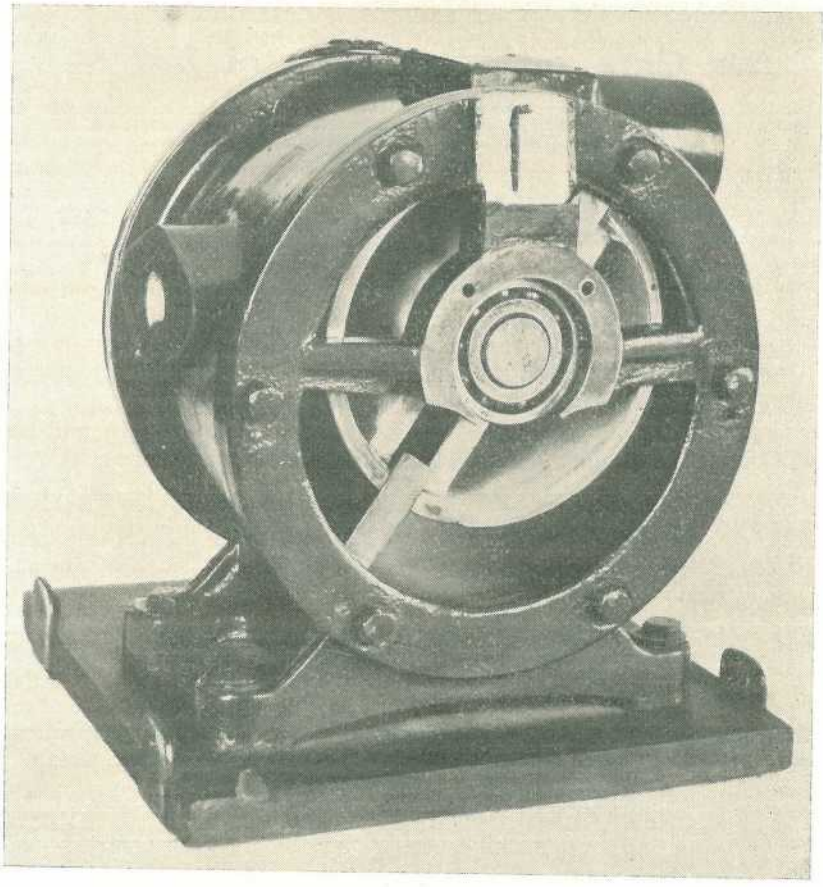


Plate 95.

Rotary Vacuum Pump Used on Milking Machines.

Given proper care the pump will last indefinitely. However, as it is finely machined, neglect will not only cause excessive wear and loss of efficiency, but ultimately will necessitate its reconditioning or replacement.

The vacuum pump depends on oil to provide an airtight seal. Only the special vacuum pump oil should be used to lubricate it. The two oil wells, one on each side of the pump, should be refilled before each milking, as, if the lubricating system is efficient, the oil wells should not be more than half full after each milking.

The oil wick should be removed and cleaned weekly or replaced. At the same time a piece of fine copper wire should be slid down the oil tube to make sure the oil can flow freely down to the bearings. A three inch length of good quality pipe cleaner will make an ideal oil wick. Bending it in the form of a U with legs of equal length will ensure that sufficient oil reaches the bearings. Oil wells should be cleaned thoroughly every three or four weeks.

During cold weather a knocking sound may be heard when starting the pump, but it should cease after one or two minutes running. It results from the oil being too thick or gummy, which causes the blades to stick in their slides. This knocking is not harmful and there is no need to dismantle the pump. To avoid this trouble during cold weather, a few drops of petrol may be poured down the oil feed pipe after removing the wick. If this is done it is important to replace the oil wick before commencing the next milking. It is also advisable in cold weather to operate the pump without vacuum load for about one minute to allow the oil to become fluid. If a clatter persists the pump has a serious fault necessitating expert attention.

If a moisture trap is fitted to the vacuum pump, it should be cleaned before every milking to prevent the entry of dust and moisture into the pump.

Vacuum pumps are made in various sizes, and the firm supplying the machine will fit a pump of sufficient capacity for the number of sets of cups on the machine. The pumps are operated at speeds between 250 and 400 revolutions per minute, depending on the number of units (sets of teat cups) on the machine. The correct speed is that which gives an adequate flow of air through the relief valve when all teat cups are on the cows and the machine is operating at a normal vacuum. If an extra bail is added to the shed, or the machine "doubled up," the pump speed will also need increasing.

The best drive for a vacuum pump is given by a V-belt, but as its use is not always practicable, a flat belt is often used. The belt drive must be kept in good condition, free from oil, just snug when stationary, and with a slight sag on the loose side when running. A tight belt overloads the bearings unnecessarily and moreover is not always one which will not slip. A slipping belt should always be promptly attended to.

Vacuum Tank.

The maintenance of a steady vacuum level is important for efficient machine milking. The relief valve, or vacuum regulator, can, to some extent, control the vacuum, but the function of the vacuum tank is to assist in preventing sudden changes; it is, in effect, a vacuum reservoir. For example, it smooths out the immediate effect of the sudden inrush of air when a set of teat cups falls off a cow, or the cups are being changed from one cow to another. It also acts as a trap to prevent milk froth and condensed moisture passing from the pipes of the machine to the vacuum pump. The only trouble likely with this part of the machine is leakage of air due to perished rubber rings, which should be tested for with a lighted match.

Some machines have no vacuum tank, but in order to serve a similar purpose, the inner chamber of the releaser is usually larger than in a machine fitted with a vacuum tank.

It should be noted at this stage that good design of milking machines involves correct placement of the various parts relative to one another. The vacuum regulator valve and vacuum gauge are preferably mounted as close as practicable to the vacuum tank, where the fluctuations in the vacuum are less than elsewhere on the machine. Therefore, the control and measuring of the vacuum are more efficient in this position.

Vacuum Gauge.

The only reliable vacuum measuring device is the mercury column or manometer. However, as it is too fragile and cumbersome for use in the milking shed, the Bourdon type vacuum gauge is in universal use on milking machines. The front of this gauge, with the graduations 0—30 and the pointer, is familiar to every dairy farmer, but Plate 96 shows the gauge with the back removed. It consists of an elliptical tube, sealed at one end and open at the other, connected *via* a suitable link system to the pointer. When the open end of the tube is connected to the milking machine and the vacuum pump started, the reduced pressure inside the tube allows the atmospheric pressure to bend the tube, thereby pushing the needle around on the face of the instrument.

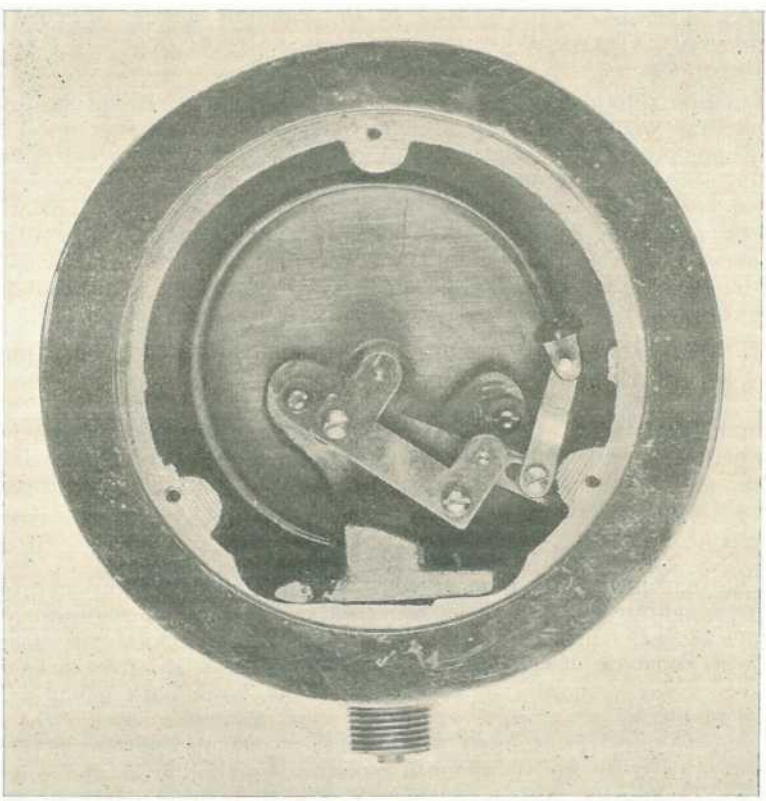


Plate 96.

Interior of Vacuum Gauge.

In spite of several weaknesses for cowshed use, this gauge is the only practical one for the purpose. The slamming of the pointer against the zero stop as the vacuum is released, changing vacuum which wears the working parts, and dirt and moisture finding their way into the mechanism, all affect the accuracy of the gauge. A high proportion of gauges tested on farms has been found to give inaccurate readings. Often the true vacuum is several inches higher or lower than that recorded by the gauge pointer.

If a farmer is troubled with the teat cups falling off cows and the gauge reads 13-15 inches, the normal range for machine milking, the gauge should be suspected; probably the true vacuum is several inches lower. Within a range of several inches above or below 14, vacuum level does not appreciably alter the rate of milk flow from the cow. However, as high vacuum can cause discomfort to the cow and actually damage the delicate udder tissue, milking should not be done at a vacuum over 15 inches.

From what has been said, it can be understood that, under farm conditions, the actual reading of the pointer on the vacuum gauge is often not entirely trustworthy. It is therefore recommended that the gauge should, at least once yearly, be overhauled, cleaned and checked against a true gauge or a known source of vacuum. Field officers of the Division of Dairying of the Department of Agriculture and Stock are supplied with a tested vacuum gauge, which is frequently re-checked, and the local officer will be glad to check the gauge on the milking machine for any dairy farmer in his district. If the gauge should prove to be in poor working order, sticking or not showing a true vacuum reading, it should be sent to the distributor for repairs or replacement.

Relief Valve or Vacuum Regulator.

Successful machine milking is dependent largely on the ability of the vacuum pump to maintain the desired vacuum in the machine. Some air is necessarily admitted to the machine by the pulsators to enable the inflations and releaser to perform their special functions during milking and through the small hole in each claw to enable the milk to be carried away to the releaser.

As indicated earlier, a good vacuum pump should have sufficient capacity to remove all of this air and sufficient reserve to cope with a few leaks and any sudden inrush of air; for example, when the teat cups fall off or are changed from cow to cow.

The object of the relief valve is to control the vacuum in the milking machine. If the vacuum rises above the desired limit, it must admit air, and conversely, shut it off if the vacuum falls too low.

Relief valves or vacuum regulators are of three types, shown in Plate 97, namely:—a, spring-loaded ball valve; b, spring-loaded poppet valve; c, weighted valve.

In exhaustive tests on relief valves in New Zealand, all ball valves were unsatisfactory for controlling the vacuum on milking machines. A few spring-loaded poppet valves nearly reached the desired standard, but most were well below. Weighted valves gave much better results. Another advantage of the weighted valve is that, being operated by a fixed weight, so long as it is kept clean and in good condition, the

vacuum is kept at the required level and cannot become too high. Thus, if the vacuum gauge is registering incorrectly, the farmer is not misled; in fact, the vacuum gauge could be dispensed with on machines fitted with a weighted relief valve.

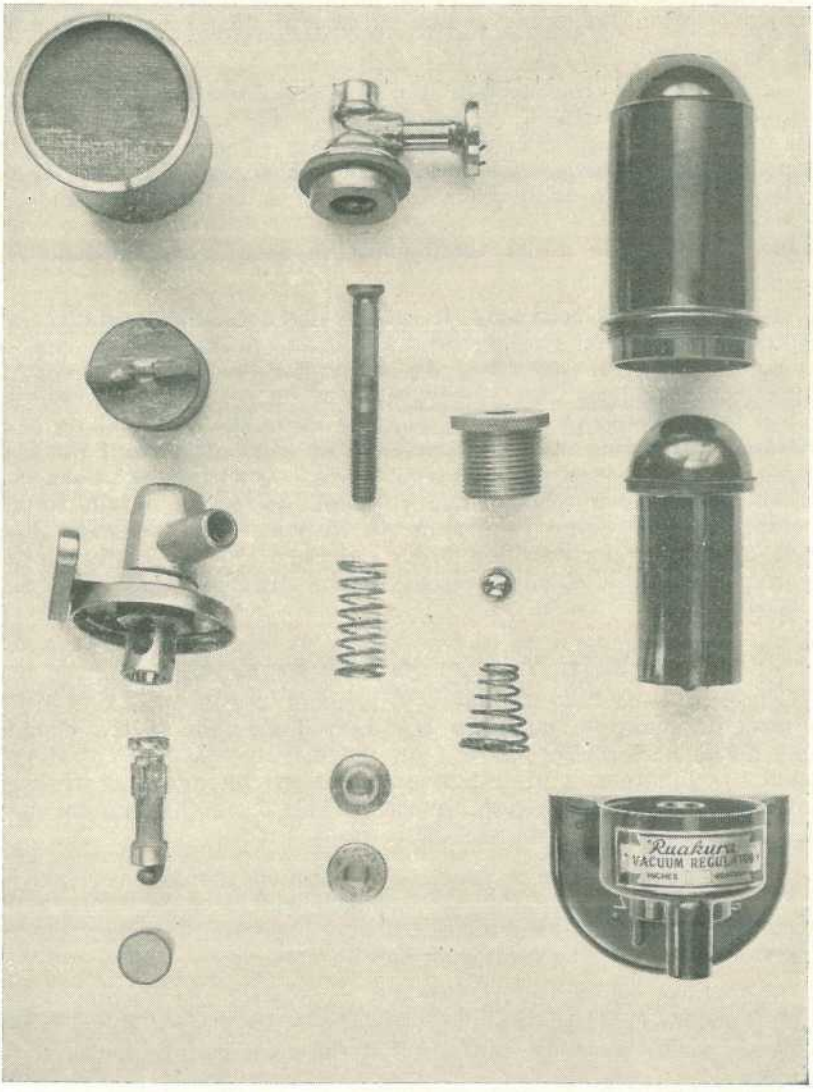


Plate 97.

Types of Relief Valves or Vacuum Regulators. Left to right—weighted type; mushroom type; ball type; weighted type.

There should be a flow of air through all relief valves most of the time during milking. This air carries dust, which quickly fouls the valve. Consequently, the valve should be dismantled and cleaned weekly and a drop of oil put on the stem of poppet types. If the

valve seat shows signs of wear or corrosion, it may be ground in, using some metal polish or rouge. Valve grinding paste should not be used. The ball in the ball type valves becomes pitted with rust after some time, and should be replaced.

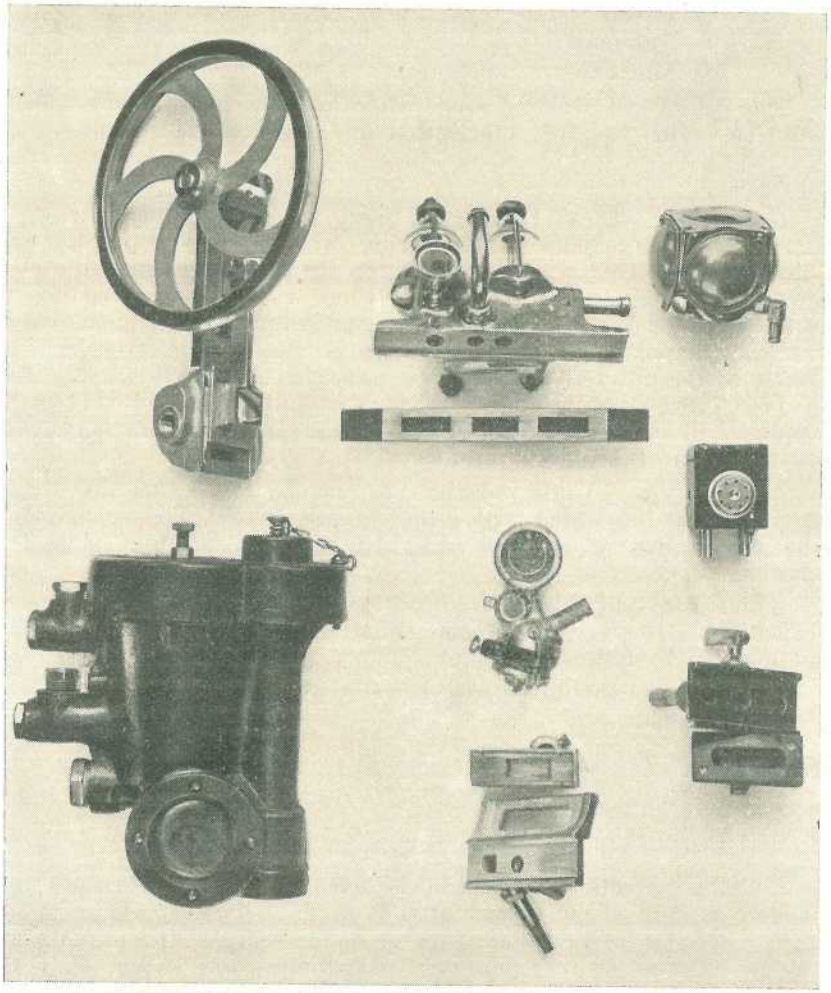


Plate 98.

Pulsators in Use on Milking Machines. Starting at left hand side and reading downwards:—Ridd (slide); Waugh and Josephson (rotary); McDonald Imperial (slide—single pipeline machine); Alfa (magnetic); Alfa (slide); International (automatic—single pipeline machine); Alfa (automatic); Simplex (slide).

Pulsators.

The pulsator is the device which, by producing an intermittent vacuum, causes the squeeze and release of the inflation in the teat cup during milking. The milking machine sucks the milk from the udder of the cow and the pulsator causes the inflations to have a massaging effect on the teats, so maintaining circulation and avoiding swelling. The pulsator is also used to operate the releaser.

Every milking machine is fitted with one or more pulsators, of which there are numerous designs (see Plate 98). The types can be classified as follows:—

(*a*) Slide.
(*b*) Rotary.
(*c*) Automatic.
(*d*) Magnetic.

The pulsators require some attention to ensure their efficient operation. This involves lubrication and correct adjustment.

Lubrication.

Slide Type.—Clean thoroughly every week and apply a smear of odourless petroleum jelly to the bearing surfaces. If the pulsator slide is fitted with felt oil wicks, apply a few drops of light machine oil to the wicks weekly. The non-oiling type will be improved by the application of a little odourless petroleum jelly. It is seldom realised that when a pulsator is working there is considerable pressure on it because of the different pressures on each side of the slide. Therefore adequate lubrication is essential. However, if excess oil is used the vacuum will draw this oil into the air lines, which may cause contamination of the dairy produce.

Rotary Type.—These pulsators are usually located on the vacuum pump and are lubricated with either grease or oil. The recommendations in the instruction book supplied with the machine should be followed.

Automatic and Magnetic types as a general rule require no lubrication. However, the recommendations in the instruction manual should again be followed.

All pulsators should be wiped over with a greasy rag once weekly to clean off dust.

Adjustment.

When adjusting pulsators there are two factors to consider—firstly, the number of pulsations per minute, and secondly, the ratio of squeeze to release of the inflation for each stroke of the pulsator.

Usually the rate of pulsation, as fixed by the manufacturer, will not alter as long as the farmer attends to the drive, especially in belt-driven types, to insure that there is no belt slip. It normally lies between 42 and 48 per minute. Experience has shown that this is a satisfactory rate, although one make of machine milks quite satisfactorily with a pulsation rate of 65 per minute. The main requirement is that the pulsations should be regular and even.

The ratio of squeeze to release usually lies between 25-75 and 50-50, the most common being 50-50. Incomplete experiments reported in New Zealand suggest that a longer squeeze than 50-50 with some cows causes a decline in the rate of milk flow. In other words, the machine then becomes the limiting factor in milking. For this reason, in order to operate well away from the limit at which milking commences to slow up, a 25-75 ratio has been suggested as a convenient working figure. There are no known disadvantages in using a short squeeze action. However, where doubled-up units are used (that is, two sets of cups to each bail and pulsator) the ratio must be set at 50-50. The ratio for the releaser pulsator must also be set at 50-50.

Within the range mentioned, the ratio of squeeze to release is not critical, the important factor being to ensure that it is the same in every bail, because not always are the same cows milked in the same bails.

Should the pulsators get out of adjustment, the best plan is to start the machines and adjust each pulsator in turn so that each set of cups has the same length of time for squeeze and release. Instruction books issued for each make of machine should show how to adjust the pulsators. All brackets, driving collars, connecting rods, &c., should be checked monthly for slackness.

Teat-cup Assembly.

Plate 99 shows two of many commonly used types of teat-cup assembly or claws. As most farmers know, there is a small hole in the end of the claw on all releaser type machines. Claws of bucket plants and machines with a plunger pump in every bail do not have this hole. The hole is placed in the claw to admit air, which assists in raising the milk to the overhead milk line, and so prevents the teat cups from flooding and falling off. Most farmers also know from experience that if this hole becomes blocked with a fly or a speck of dirt, the cups will fall off the cows. However, cases of cups falling off a few cows in the herd, usually the easy milkers, are often due to the hole being partly clogged with dirt. Each time the claw is washed, a needle or piece of fine wire should be pushed through this hole to ensure that it is quite clear. Blocked air admission holes may be associated with a higher incidence of mastitis.

Inflations should be cleaned thoroughly after each milking by following the recommendations for the cleaning of milking machines summarised at the end of this article. This will aid in producing clean milk and in preventing udder troubles. If boiled once weekly in a weak caustic soda solution (5 per cent.) their "life" will be lengthened. The inflations should be kept taut, but not over-stretched, and replaced as necessary. Field observations have shown no special advantages for either plain or moulded inflations. It may also be mentioned that for success in omitting hand stripping after machine milking, the teat cups, which tend to crawl up the teat and prevent the complete withdrawal of milk from the udder, should be gently pulled down towards the end of milking. Discomfort and even damage to the udder may result if cups are left too long on cows after the milk flow has ceased.

Releaser.

The releaser enables the milk to be removed from the milking machine without breaking the vacuum and allowing the teat cups to fall off. Plate 100 will assist to explain the principle of its operation. It consists of two chambers A and B, and two flaps D and E, operated by a pulsator which connects the outer chamber B, to the vacuum pump, and pressures between the inner and outer chambers are equalised. The weight of milk then opens the inner flap D and the milk flows through to the outer chamber B. Meanwhile the atmospheric pressure keps the outer flap E closed tight. On the next stroke of the pulsator, the atmospheric air is admitted to the outer chamber B, sealing the inner flap D and equalising the pressure on both sides of the outer flap E. The milk can then force this flap open and flow out.

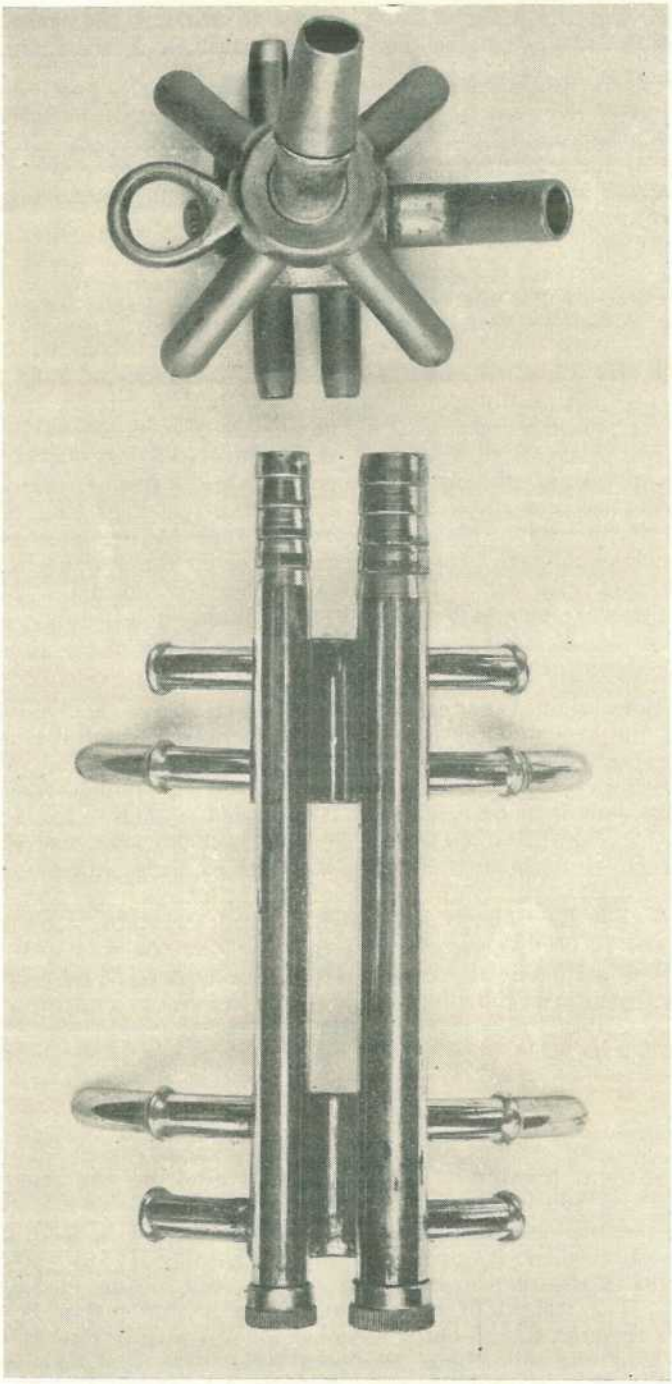


Plate 99.

Claws for Teat-cup Assembly. Top, Ridd; bottom, Alfa Daisy.

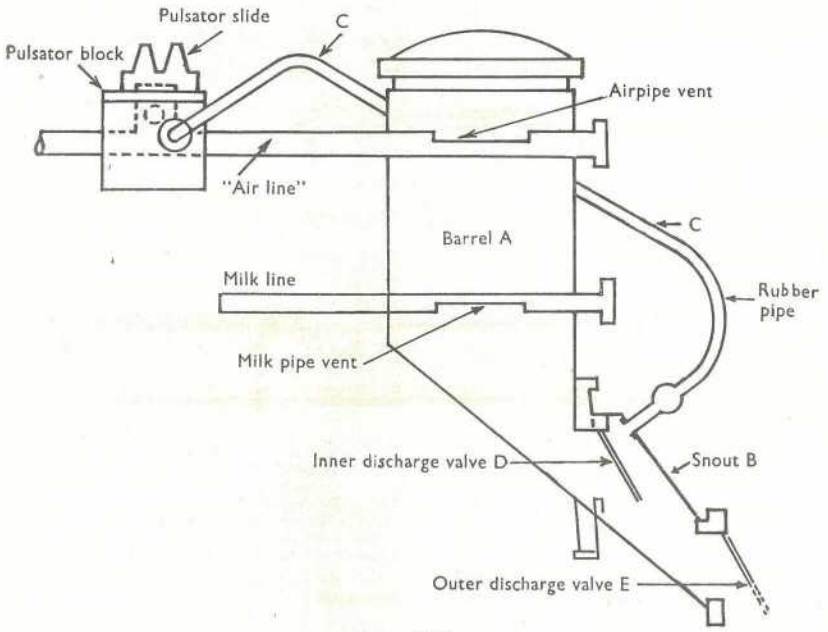


Plate 100.

Details of the Operation of the Releaser.

(From " Dairy Farming in Australia.")

The usual faults which occur with a releaser are caused by air leaks. These leaks make it impossible to equalise pressures, and the milk cannot be released. This milk eventually finds its way into the air section of the machine and flows along to the vacuum tank and pump. The remedy is obviously to find the leaks and seal them. The usual places are the flaps. which if cracked and worn, should be replaced. Other trouble spots are (*a*) the rubber seal between the two chambers; (*b*) the rubber tube from pulsator to outer chamber, including its connection to pulsator and releaser; and (*c*) the pulsator itself.

These parts can be examined with a lighted match to locate any air leaks. A similar examination should be made periodically for air leaks at joints, bungs, rings, &c., on other parts of the milking machine.

Sight Glass.

A sight glass on the milk pipeline helps to ensure that teat cups are removed as soon as the cow is milked out. Cups left on too long may damage the udder and predispose to mastitis.

BUCKET TYPE MACHINES.

In this type of machine the milk is drawn from the cow in the usual manner, using teat cups and claw of conventional design. The milk is delivered into a vacuum bucket which is usually stood beside the cow, but in some overseas models is suspended from the cow with a surcingle. Therefore the milk line and releaser are not used with bucket machines.

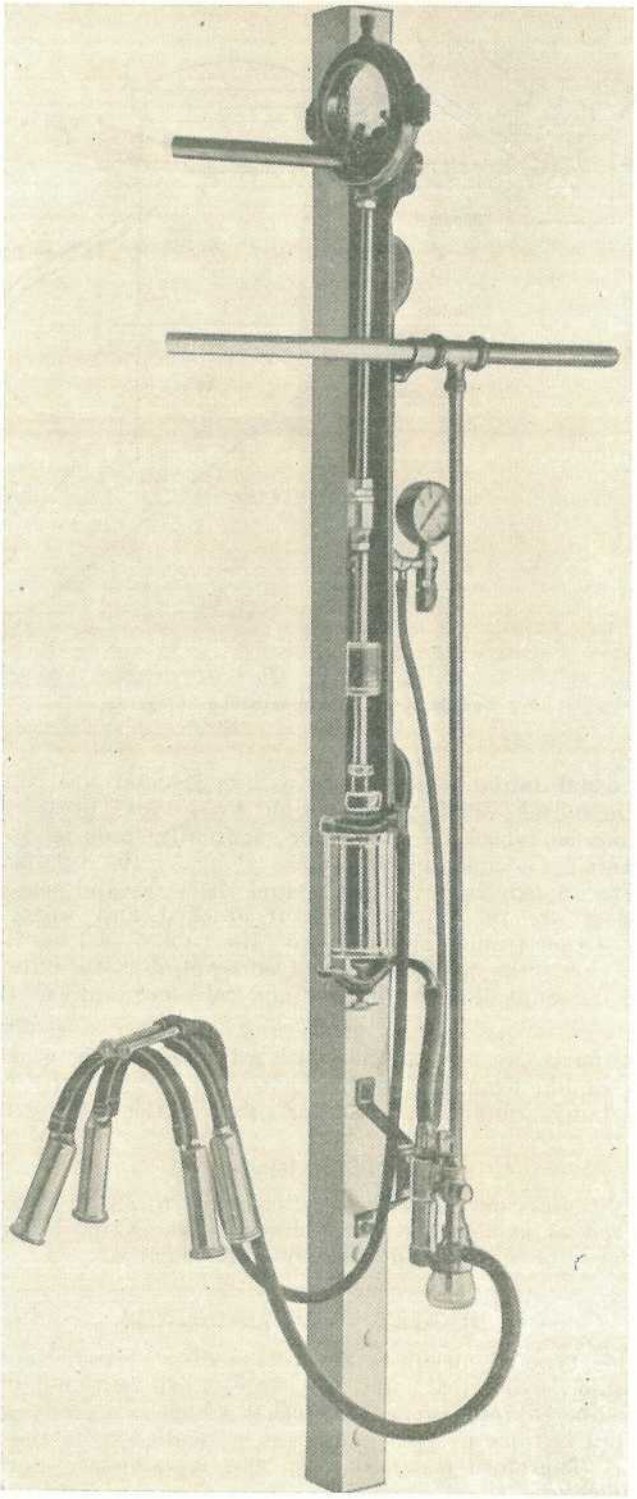


Plate 101.
An Independent Unit Machine.

Pulsation is arranged by the use of an automatic pulsator attached to the bucket, and the complete unit—that is, claw, bucket, and pulsator—is portable and ideal for use where stall feeding is practised. The machine consists of vacuum pump, vacuum tank, vacuum gauge and relief valve, as in releaser machines, and a vacuum line is erected so that there is a tap near each cow to supply vacuum to the bucket, pulsator, and cups.

Bucket plants are not used to any appreciable extent in Queensland. Since dairy herds are grazed in open paddocks and separate feeding stalls are recommended rather than feeding while milking, the moving of the bucket from cow to cow and carrying of the milk from the cow to the separator room make this type of plant slower and less convenient to operate than the releaser-type machine.

INDEPENDENT UNIT MACHINES.

One make of milking machine sold in Queensland has a pump in every bail. The complete unit is shown in Plate 101. The operating cycle of this type of plant is discussed for the information of owners.

Each stall unit is complete and independent of the other units. In addition to the orthodox teat cup assembly, it is fitted with a double-acting pump, a vacuum regulator valve, a vacuum gauge, a relief valve and a milk chamber containing three valves, sight bowl, and connection to the milk line.

The double-acting pump supplies the energy for milking the cow, creating the pulsations, and pumping the milk to the overhead milk line for conveyance to the milk vat by gravity.

On each revolution of the drive shaft the pump makes two strokes.

The following describes the action of the top section of the pump. The down-stroke of the piston opens the inflation by raising the vacuum above the pump and therefore through the pulsation line to the outside of the inflation. During this phase, milk flows from the teats.

The up-stroke of the piston reduces the vacuum in the pulsation line to atmospheric level. The difference in pressure on each side of the inflation—that is, vacuum on the milk side and atmospheric pressure on the pulsation side—causes the inflation to close against the teat, and so provides the necessary "rest" and "massage" of the teat.

At the top of the tube leading from the top-section of the pump there is a ball valve, to allow any excess air to escape on the upward stroke and ensure that only atmospheric pressure is applied to the teat during the closed phase of the inflation. This valve is called the relief valve, and hissing from this valve during operation of the unit indicates an air leak, which may occur in any of the following places:—

(1) in the pump from bottom to top section;

(2) around the gland at the top of the pump;

(3) through the seal at the top of the pump barrel;

(4) around the mouth or nut of the teat cups;

(5) through the cap or rubber connections to the claw;

(6) through a split inflation.

Milk spray through this valve would immediately suggest a split inflation in that particular set of cups. For maximum efficiency all of these leaks should be sealed, when hissing from the relief valve will cease.

The bottom section of the pump operates as follows:—The down-stroke closes the inlet valve in the milk chamber and so prevents vacuum being entirely lost between the inlet valve and cups during the open phase of the inflation, at which time milk is flowing from the udder. This stroke also opens the delivery valve and pumps milk from the milk chamber to the overhead milk line. The up-stroke closes the delivery valve, preventing return of the milk, opens the inlet valve, allowing milk to flow into the milk chamber, and raises the vacuum in the milk section to draw milk from the cow and hold the cups on. The third valve in the milk chamber is a simple ball-valve to check any milk entering the pump.

The regulator valve situated under the vacuum gauge controls this vacuum and the vacuum gauge measures the vacuum.

It is essential that there be no air-leaks in this section of the machine, and that the valves seat perfectly. Every joint is provided with a fibre washer, and this washer must be replaced after normal cleansing operations. It should be noted that there is *no* hole in the claw of this machine.

The company distributing the machine publishes an instruction book, in the back of which is an efficiency test. If this test is applied to each unit and the necessary adjustments made, a job taking only a few minutes each week, no difficulty will be experienced in operating. These books are available to farmer operators of this machine.

SUMMARY.

The mechanical aspects of milking machines which are of chief importance for efficient milking are:—

(1) The vacuum pump should have an adequate air displacement.

(2) The relief valve should be reliable and sensitive.

(3) Pipe joints, rings, flaps, &c., must seat properly to prevent air leaks.

(4) The slides of the pulsator must fit properly to stop air leaks and the pulsator action must be regular.

In the milking process the main points are:—

(1) Avoid noise and rough handling of cows. Secure the co-operation of the cow by kind treatment at all times.

(2) Check the foremilk and wash the udder to stimulate milk let-down about one minute before milking begins.

(3) Avoid a high vacuum; adjust the relief valve to "blow off" at 14 to 15 inches vacuum.

(4) Remove the teat cups as soon as milk flow ceases.

(5) Maintain inflations taut and in good condition and replace as necessary.

(6) Strip by machine. If necessary, bear down on the claws to remove the last milk.

In cleaning the machine the procedure to follow is:—

(1) Just before each milking flush the milk system with clean, cold water containing a chlorine compound in the proportion indicated by the manufacturer.

(2) After use, rinse each unit with at least 1 gallon of cold water.

(3) Run through the milk system a hot, dilute caustic soda solution (1 level dessertspoonful of caustic soda to 4 gallons of hot water), using 1 gallon of the solution to each set of teat cups.

(4) Run plain *boiling* water through each set of teat cups, using at least 1 gallon (preferably 2) of boiling water for each unit.

(5) Sterilize the milk system with steam.

(6) Once daily thoroughly cleanse the air lines.

(7) Remove and dismantle the releaser and vacuum tank, wash each thoroughly, sterilize with steam and store in a dust-free place.

(8) Disconnect teat cups and all rubbers. Open up all flaps or remove rubber plugs on the machine.

(9) At least once a week completely dismantle the machine and thoroughly cleanse and sterilize it.

Proper training of the cows, together with regular and systematic cleaning, lubrication and adjustment of the various working parts of the milking machine, will ensure efficient, trouble-free milking.

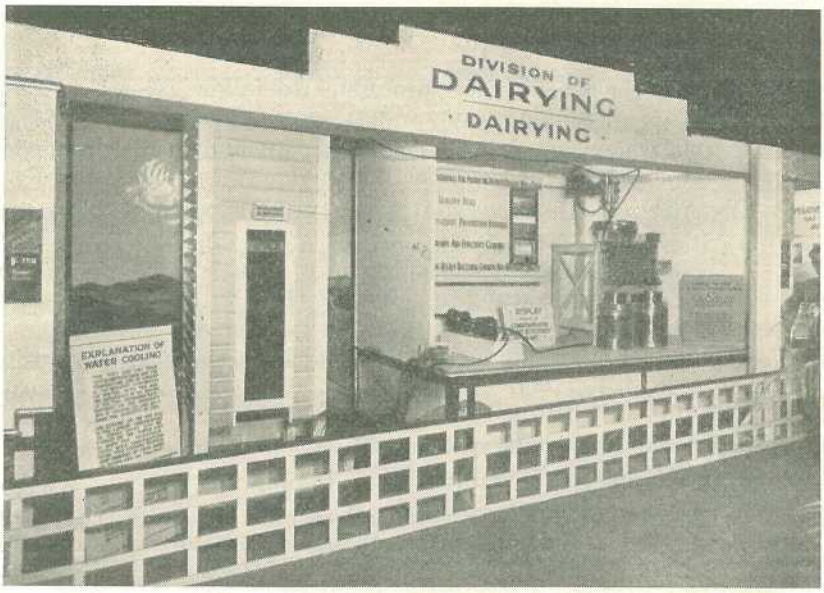
POULTRY MEAT TAINTED BY BHC-TREATED GRAIN.

Tests carried out by the Poultry Branch of the Department of Agriculture and Stock have shown that the flesh of fowls fed on grain treated with the commercial grade of the insecticide benzene hexachloride (BHC) may have a musty flavour when the birds are slaughtered.

BHC has proved to be very effective in protecting wheat, maize and other grains against insect damage. It is compulsory to use it on hybrid maize, grain sorghum and French bean seed submitted for certification, and in view of the current shortage of carbon bisulphide some other grain is also being treated with this insecticide. While it in no way harms grain intended for sowing, it should not be used on grains which are to be fed to poultry, as in addition to its flesh tainting properties it may also give eggs a musty flavour.

There is some evidence that milk may be tainted, and so it is tentatively recommended that BHC-treated grain be not fed to milking cows.

Deodorised BHC is marketed by the trade, but its use as an insecticide in stored grain appears to be too costly where a large quantity of grain is concerned.



A Tower Recirculated Water Cooling System was Operated by the Division of Dairying to Demonstrate this Method of Milk and Cream Cooling to Show Visitors.

The Main Features of the Cattle Husbandry Branch's Show Display were the Parts that Dehorning, Pest Control and Crop Fattening Play in Improving Beef Production.

ANIMAL HEALTH

Infectious Calf Pneumonia.

O. H. BROOKS, Divisional Veterinary Officer.

THIS disease has been known to exist for a considerable period, but appears to have become more widespread during recent years. Losses of up to 75 per cent. of calves have sometimes occurred, due in many cases to sickness and deaths continuing for several weeks before the disease has been diagnosed correctly.

The primary infection is thought to be caused by a virus, which acting in conjunction with other infective agents causes pneumonia.

Source of Infection.

The introduction of infectious pneumonia usually follows close contact with "carriers" or infected surroundings. Calves that recover from pneumonia may remain infectious for a long period even though they appear to be healthy.

Infection escapes from the lungs of affected animals in the breath, nasal discharges, and dung. Close contact allows the infection to be carried in the air from one animal to another.

Drinking vessels become contaminated when infected animals are swallowing, as infectious discharge flows from the nostrils.

Calf pens may become heavily contaminated and if in shaded surroundings, can be a source of infection for long periods. Exposure to sunlight will destroy infection.

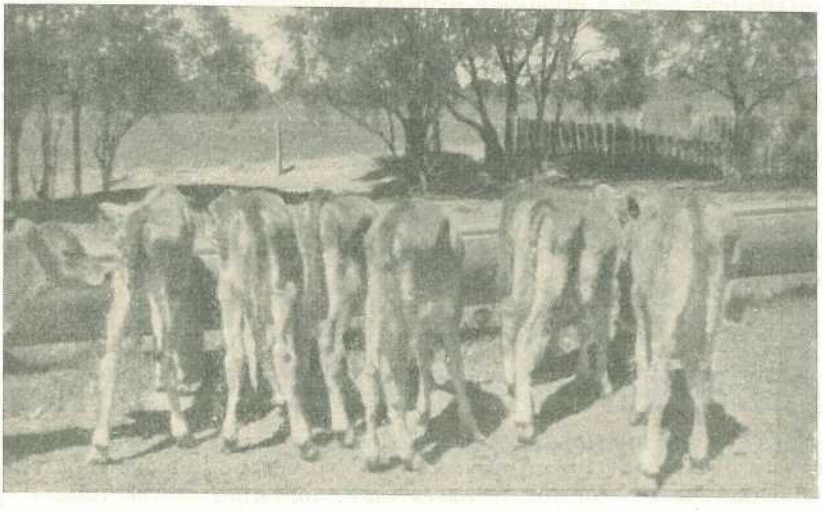


Plate 102.

Calves Suffering From Infectious Pneumonia.

Susceptibility of Calves.

Calves from a few weeks to six months of age are susceptible to infectious pneumonia. The most susceptible age appears to be about three weeks, after which there is an increasing resistance to infection, although losses do occur among calves that have been weaned. Some calves, irrespective of age, have a natural resistance and do not become infected.

The disease may cause death within a short period, or develop into a chronic sickness which leaves the calf stunted and unthrifty. When an outbreak occurs, the majority of calves of the susceptible age may show evidence of infection. Calves having a high degree of resistance to the disease return to normal within a few days, while those with a low resistance due to faulty feeding, malnutrition or exposure develop pneumonia. The percentage of deaths will depend upon the severity of the infection, and the degree of resistance of the calf. In some herds, only odd sporadic cases occur. More often many calves are affected and about half of them die, while those that recover suffer a serious setback for weeks or months.

Symptoms.

Infectious pneumonia may occur in acute, sub-acute and chronic forms, depending on the severity of the infection, the duration of the sickness, and the susceptibility of calves. In the acute form calves may die within 48 hours of the first noticeable symptoms. When the disease first makes its appearance in this form, it may be mistaken for other diseases such as blackleg and poisoning. Sub-acute cases develop typical symptoms, and death may follow a sickness of several days' duration. Calves affected with the chronic form become weak and stunted and usually have to be destroyed.

In the early stages of the disease calves are usually thirsty and have poor appetites as the result of a high temperature (104-105 deg.). The calf becomes dull, and usually segregates itself from the mob. There is a watery discharge from the eyes, and a mucous discharge from the nostrils may form a crust-like scab on the muzzle.

Pneumonia causes abnormal breathing, with exaggerated flank movement. Abnormal noises may be detected within the chest cavity. Severely affected calves cough frequently, while milder cases may cough only occasionally, more especially when disturbed. The cough is husky and is usually followed by a discharge of thick mucus from the nostrils.

Calves lose condition rapidly (Plate 102) and become very weak. It is usual for indigestion to occur, resulting in a white foul-smelling scour, which becomes matted on the hair of the tail. In some cases blood is passed in the faeces.

Post-mortem Findings.

Healthy lung has a glistening smoothness, a salmon pink colour, a spongy inflated texture, and will float on water.

When the lung becomes inflamed and ceases to perform its normal function, it is referred to as pneumonic. Infection of the lung causes inflammation of the air passages and congestion of the lung tissue. Secondary infection causes a breakdown in the spongy structure.

Pneumonic lung in the early stages is dark red in colour, firm or solid, heavier than normal, and will sink in water. Older lesions become grey to creamy white in colour, with a sharp demarcation between the pneumonic and healthy lung (Plate 103).

All or portion of both lungs may be affected with pneumonia. However, it is usual to find lesions confined to the front lobes and the lower borders of the lung, with one lung affected more than the other.

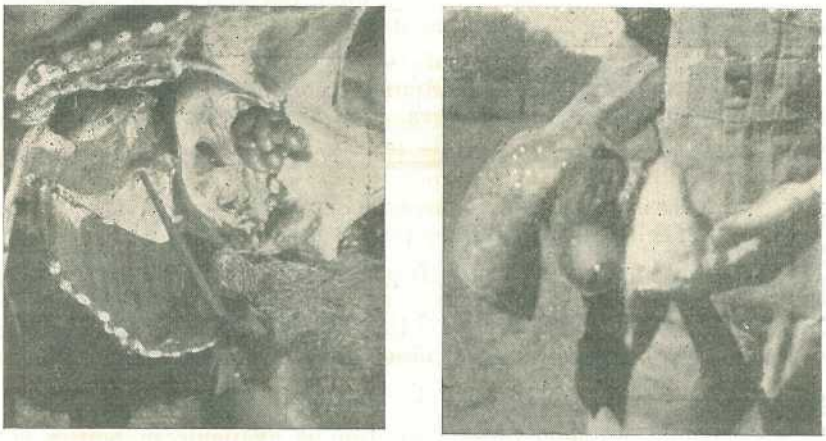


Plate 103.

Post-mortem Appearance of a Pneumonic Lung. In the left-hand picture, an infected lung is shown in the thorax, lying between the steel and the knife. In the other picture, the pneumonic lung is held in the right hand and a normal lung in the left, with the heart between.

There is usually an excessive quantity of fluid in the chest cavity, resulting from pleurisy, and the lungs may adhere to the chest wall. The heart sac may also be distended with excess fluid. In chronic cases the lung tissue usually contains many small abscesses the pus in which is creamy yellow in colour.

The lymph glands at the base of the windpipe where it divides are usually swollen and juicy. The liver becomes dark red or purple, and there may be many small haemorrhages in the kidney due to toxaemia.

Diagnosis.

When pneumonia first makes its appearance, deaths may be confused with other conditions such as "white scours," lung worm infestation and poisoning, depending upon the form of the disease experienced. A diagnosis can be made by doing a post-mortem examination, when lesions of pneumonia can be easily seen and felt.

Lung worms may be responsible for chronic coughing but do not of themselves cause pneumonia. Their presence in the lung is, however, often followed by pneumonia because of the irritation set up.

If there is any doubt about the diagnosis or action to be taken to control an outbreak, a private veterinarian or officer of the Department of Agriculture and Stock should be consulted.

Treatment.

Certain sulphonamide drugs are effective for treating infectious pneumonia provided treatment is commenced in the early stages of the disease and the proper dose, according to the weight of the calf, given regularly each day for the prescribed period. These drugs are restricted under a provision of the Health Acts, so it is necessary to have a prescription from a veterinary surgeon before they can be purchased.

Sulphamezathine is the preferred drug. Sulphamerazine is almost, if not equally as good, while sulphapyridine has also given satisfactory results. The recommended treatments are—

(*a*) Sulphamezathine or sulphamerazine in the form of powder or 0.5 gram tablets administered once daily by mouth as follows:—1st day—1 gram for each 10 lb. liveweight; 2nd to fourth days—1 gram per 15 lb. liveweight.

(*b*) Sodium sulphamezathine in the form of 33⅓ per cent. solution, to be injected subcutaneously once daily at the rate of 3 c.c. per 15 lb. liveweight for three or four days.

(*c*) Sulphapyridine in the form of powder or 0·5 gram tablets administered by mouth at the rate of 1 gram per 20 lb. liveweight per day, divided into two doses (morning and evening) each day. The initial dose should, however, be a full dose.

Treatment is given for three or four days.

The sodium sulphamezathine solution is available in bottles containing 100 c.c. or 500 c.c. of sterile solution. It is injected with a sterile syringe of from 10 c.c. to 20 c.c. capacity (Plate 104). By inserting a sterile needle through the thin rubber stopper, the solution can be withdrawn directly into the sterile syringe (Plate 105).

Plate 104.

Method of Injecting Sodium Sulphamezathine Under the Skin.

Plate 105.

Withdrawing Sodium Sulphamezathine Solution from the Bottle into a Syringe.

There are several ways of giving the treatments that are administered by mouth. The best method is to mix the powder or crushed tablets with milk or water, and give as a drench.

When drenching, the head should not be held higher than necessary, otherwise the dose may pass directly into the windpipe, and thus cause further irritation to the lung.

Ample water should be available at all times. Treatment for longer than five to seven days is not justified.

How to Deal with an Outbreak.

Early recognition and treatment will minimise losses and prevent calves from becoming weak and stunted. If the disease is well established, the treatment of all calves in a group may be justified, irrespective of typical symptoms of pneumonia being present. This course is commonly adopted to bring the disease under control promptly. While undergoing treatment, sick calves should be segregated, preferably in a hospital pen. Weak and stunted calves with chronic lesions of pneumonia seldom respond to treatment. Carcasses should be burned or buried.

In conjunction with medicinal treatment, calves should be protected and nourished to increase their resistance and ability to repair damaged tissue. Vitamin A supplements in the form of cod liver oil will assist to strengthen the resistance of the calf. Green feed is also a very useful source of this vitamin.

In the event of scouring being a feature, special care will have to be taken in feeding the ration of milk. No special medicinal treatment is necessary to treat the scouring.

When worm infestation is a complicating factor, treatment with phenothiazine should be given after the course of treatment for pneumonia. As worm control is primarily a matter of pasture rotation and periodic treatment, the Departmental pamphlets on this subject should be consulted.

Prevention.

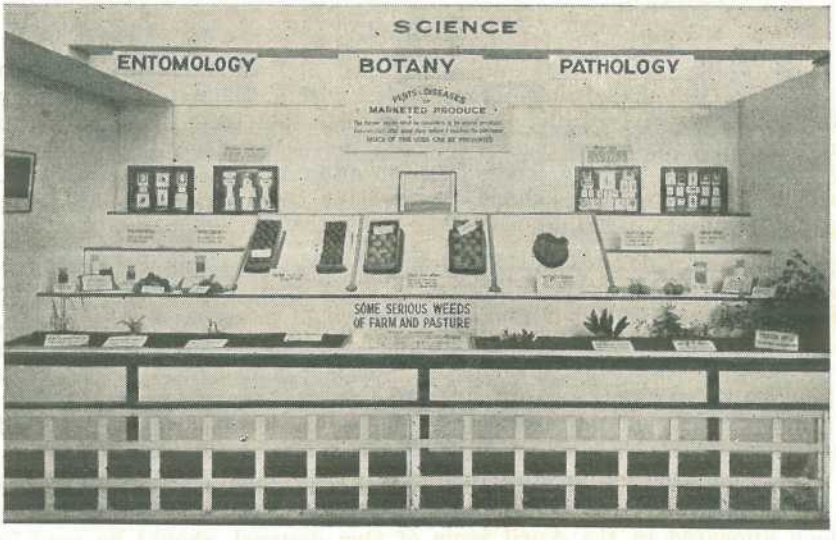
As calves often remain infectious following recovery from pneumonia even if they have been treated with sulphonamides, the only effective means of breaking the cycle of infection from older calves to younger calves is to segregate newborn calves in clean surroundings. Contact through a fence is sufficient to allow the spread of infection. Separate drinking vessels should be available, owing to infection being carried by nasal discharges.

Pens in which cases of pneumonia have occurred should be cleaned and paddocks spelled for at least one month before being used for younger calves. Shelter sheds should be exposed to sunlight, as this is the best disinfectant. While iron and cement surfaces can be disinfected with 5 per cent. lysol or 0·5 per cent. caustic soda, germs cannot be killed readily in wood, soil or organic matter by this means. Wooden troughs should be discarded unless made of sawn and dressed hardwood.

The rearing of well nourished calves will increase their resistance to this disease. An article on the feeding requirements of dairy calves, which appeared in the April issue of this Journal, should be read in conjunction with this article. Vaccination has not been found effective as a preventive.

Care should be exercised when purchasing calves. Dipping of calves at a community dip may be the means of spreading this disease during an epidemic in a district.

The Important Part Played by the Co-operative Movement in the Marketing of Queensland Produce Was Chosen for its Theme by the Marketing Branch.



Prevention of Wastage in Fruit, Vegetables and Grains After Harvest Was the Main Feature of the Science Branch's Exhibit, with Important Weeds Also to the Fore.

The 1951 Pig Meats Carcass Competitions.

F. BOSTOCK, Officer-in-Charge, Pig Branch, and Competition Judge.

THE Australian Meat Board, in association with the Department of Agriculture and Stock and with the co-operation of all sections of the industry, conducted Baconer Pig Carcass Competitions this year for the fourth time.

Judging and field days in the four competition districts were as follows:—

District.	Centre.	Date.
Northern ..	Mareeba ..	May 14
Central ..	Rockhampton ..	May 17
Darling Downs ..	Toowoomba ..	May 23
South Queensland ..	Brisbane ..	May 30

Prize Winners.

The State championship was awarded to Mr. E. B. Tumbridge, of the Downs district, for a purebred Berkshire pig which scored 87·5 per cent. The carcass, of 133 lb. dressed weight, was of good type, scoring well in all points. It had a well-developed eye muscle (27 out of 28), an even covering of fat (19 out of 20), good body length (19 out of 20), very fair streak development (7½ out of 12), and good-type shoulder (6½ out of 7), and ham (6½ out of 8), but was a little long in the leg, scoring only two points out of five.

Prize winners in their respective districts were as follows:—

Prize.	Owner.	Breed.	Weight. Lb.	Points.
		Northern.		
1st ..	J. S. Stimson	Tamworth x Berkshire ..	160	83½
2nd ..	Drury Bros.	Berkshire	120	80½
3rd ..	Wm. Hastie and Sons ..	Berkshire	134	80
		Central.		
1st ..	A. W. Davey	Berkshire x Large White ..	139	87
2nd ..	V. E. Jones	Berkshire	152	83
3rd ..	A. W. Davey	Berkshire x Large White ..	158	82½
		Darling Downs.		
1st ..	E. B. Tumbridge	Berkshire	133	87½
2nd ..	L. Puschmann	Large White x Berkshire ..	166	81½
3rs ..	F. L. Hayward and K. A. Temple	Large White	162	80½
		South Queensland.		
1st ..	B. A. Schellback	Berkshire	164	82½
2nd ..	A. E. A. Holmes	Large White	166	81
3rd ..	Queensland Agricultural High School and College	Berkshire	149	80

Plates 106-110 show prizewinning and other carcasses.

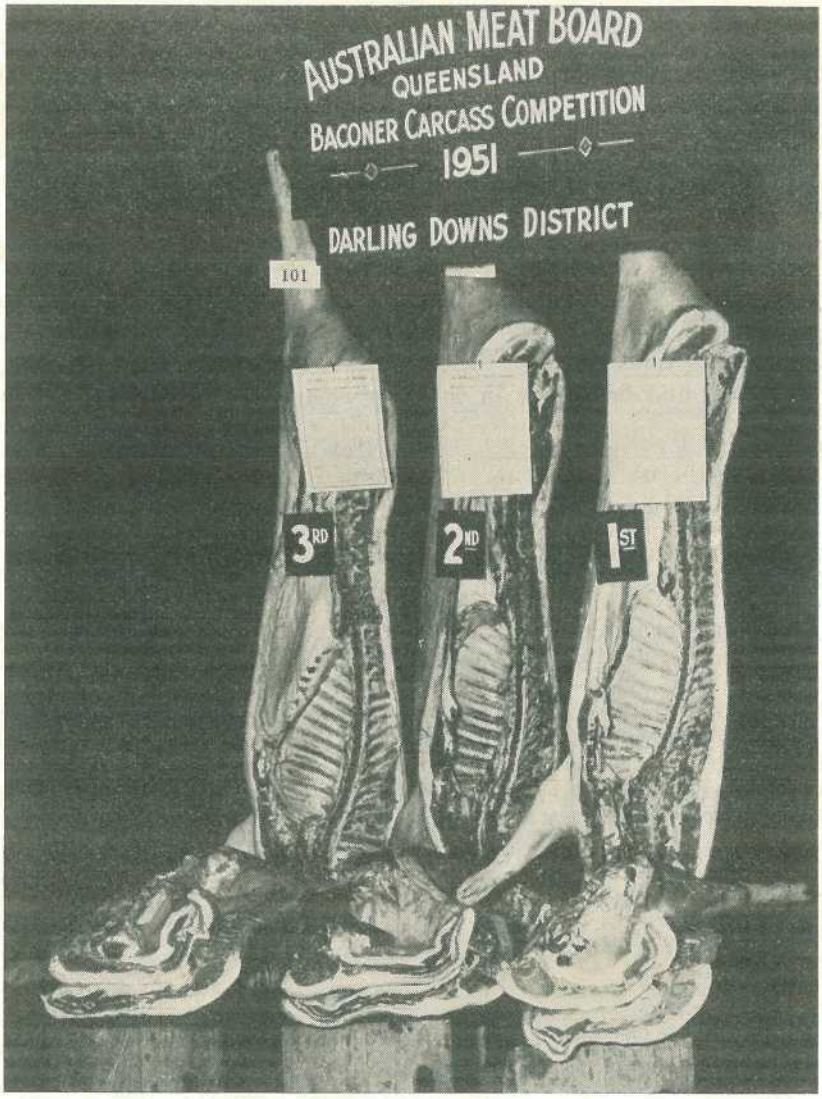


Plate 106.

Prizewinners in the Darling Downs District. The State champion carcass is on the right.

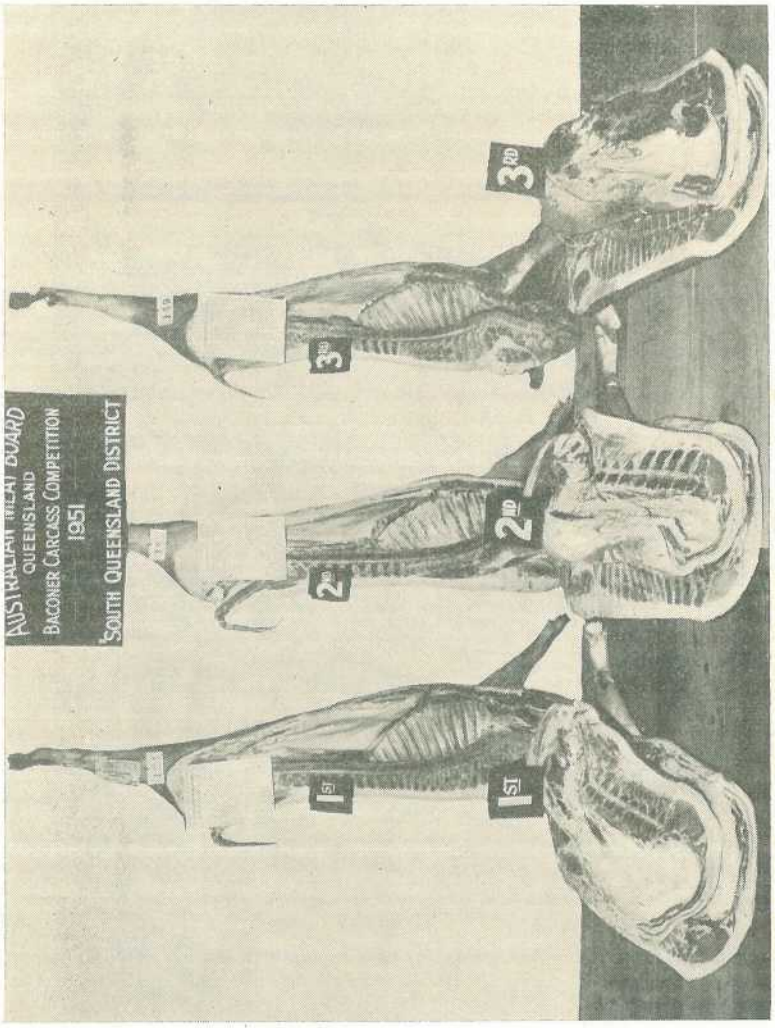


Plate 107.

Prizewinners in the South Queensland District.

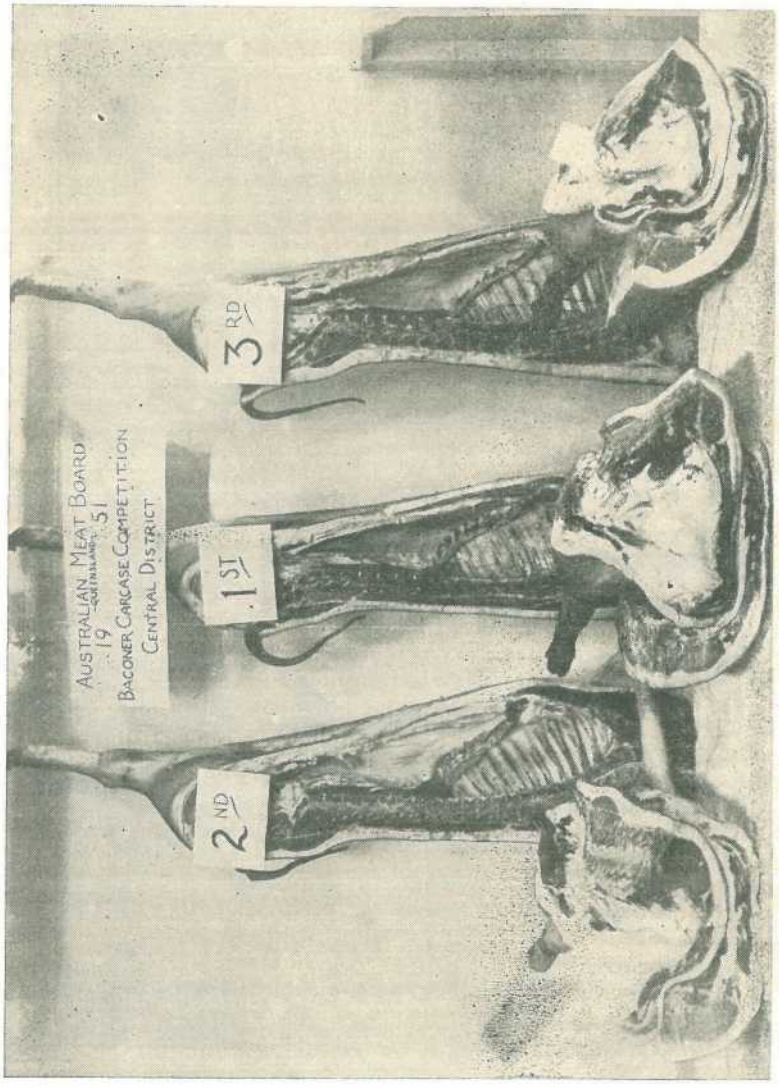


Plate 108.

Prizewinners in the Central District.

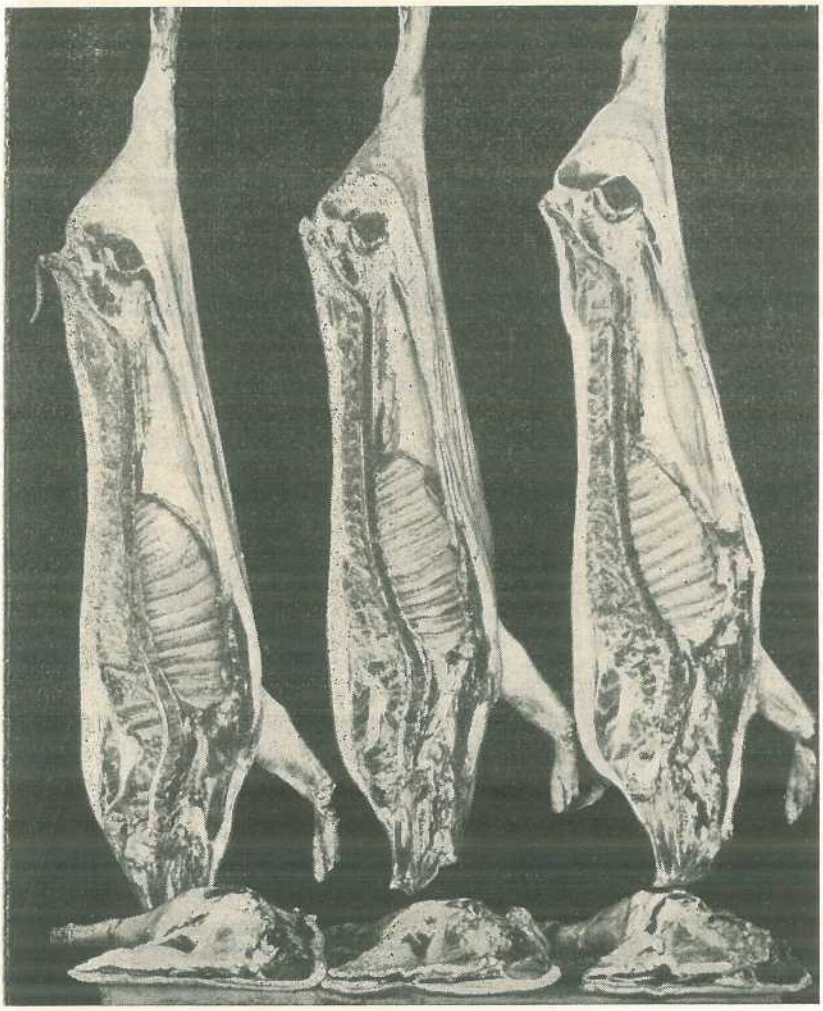


Plate 109.

Prizewinners in the Northern District. Left to right—1st, 2nd and 3rd.

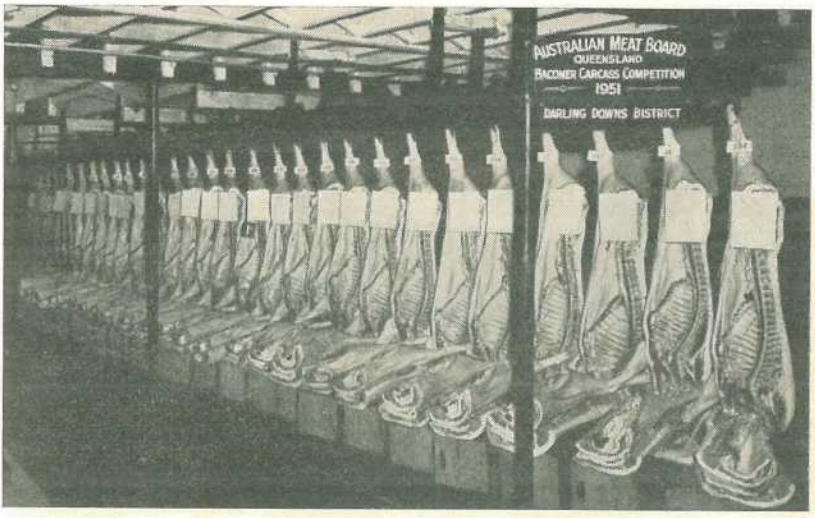


Plate 110.

A General View of the Carcasses Entered in the Darling Downs District.

Field Days.

Field days were arranged to coincide with the judging at each district centre and it was very pleasing to note that farmers gave good support by attending in numbers. This was especially so at Rockhampton, where approximately 225 attended. Every effort was made by officers of the Department of Agriculture and Stock, together with the Works management at each centre, to make these field days as instructive and interesting as possible. Farmers attending were not only given the opportunity of seeing the type of carcass entered in the competitions but were able to inspect the bacon factory or meatworks and to listen to addresses on subjects dealing with pig production and farming generally.

Comments on Entries.

To qualify for entry into the competition, the pig in the first place had to be sired by a purebred boar and the dressed carcass had to weigh between 120 lb. and 180 lb. Unfortunately 13 carcasses of the 141 submitted were either over or under the above weights. The total of 128 carcasses eligible for competition was 25 more than in the previous year.

An improvement in quality was again noted, suggesting that competing farmers had benefited from past experience and utilised to advantage information and knowledge gained at previous field days and through the display of score cards. The average score of 71·566 per cent. represented a considerable improvement on last year's results. However, while it is pleasing to note an improvement in the majority of sections, there was a loss of points in one very important point—body length. Producers should pay strict attention to this when selecting breeding stock.

The following comments are made on the various items on the score card.

Hams averaged 80·517 per cent., an improvement of 4·304 per cent. This improvement is gratifying when it is realised that the ham is one of the highest priced cuts, but farmers should continue to select breeding stock showing good development of hams in order to further improve this feature.

Shoulders scored an average of 84·598 per cent., an increase of ·934 per cent. This score is good and breeders apparently realise the importance of light shoulders, but careful selection will have to be maintained if shoulder quality is to be held at a satisfactory level.

Streak or belly did not score quite so well as last year, securing 61·784 per cent. (2·940 per cent. lower). There were several very good streaks among the entries, but more careful feeding and selection will have to be practised, because a streak which is thick and contains a large percentage of meat adds value and appearance to the bacon rasher.

Eye muscle scored very well, averaging 71·958 per cent., an increase of 21·022 per cent. on last year's low score. It is pleasing to note that producers have given this section attention and that their efforts have been so successful. However, there is still room for improvement and producers are again advised to be careful in the selection of breeding stock and to pay particular attention to feeding, especially just before weaning and on to light porker weight.

Backfat development was good, with a score of 77·226 per cent., an increase of 4·362 per cent. over the previous year. This improvement in backfat was due to selection and feeding rather than to the submission of lighter weight pigs. The entries showed again that Queensland farmers can produce a first quality carcass, not overfat, and as overfatness is still causing concern to bacon factories in the central and southern parts of the State, it is hoped that farmers will be guided by the experience gained and market pigs in prime condition.

Body length did not score as well as in the previous year, the average being 64·922 per cent., a loss of 2·019 per cent. Short body length was the most noticeable feature at all centres and emphasises the necessity for selecting breeding stock of good length. Feeding also plays its part, and rations must be properly balanced if good body length is to be retained in our pigs.

Leg length, which gives an indication of the quantity of bone contained in the carcass, was very fair, although the average score (64·218 per cent.) was 1·413 per cent. below last year's.

The overall percentage of 71·566 per cent, an increase of 6·348 per cent. on last year, represents a praiseworthy effort on the part of producers in all districts. A point worthy of mention is the fact that in no district was the score secured for 1st, 2nd and 3rd place below 80 per cent. If farmers will continue to pay attention to the careful selection of breeding stock of the right type and give consideration to the rations fed, the objective of these competitions—namely, an improvement in the type and quality of pigs forwarded for slaughter throughout the State—will be realised.

The English or Hammond System of carcass appraisal was used, and the average points for each section of judging are as follows:—

	Possible Points.	Average Points Obtained.	Percentage of Possible Points, 1951.	Percentage of Possible Points, 1950.
By Inspection—				
Hams	8	6·441	80·517	76·213
Shoulders	7	5·921	84·598	83·664
Streak	12	7·414	61·784	64·724
By Measurement—				
Eye Muscle	28	20·148	71·958	50·936
Backfat Thickness ..	20	15·445	77·226	72·864
Body Length	20	12·984	64·922	66·941
Leg Length	5	3·210	64·218	65·631
Total	100	..	71·5566	65·218

A Reminder to the Pig Raiser that Carcass Requirements Change with Time was Given by the Pig Branch at the Brisbane Show, while 50 Years of Progress in Incubation of Eggs was the Theme of the Poultry Branch.

Brucellosis Testing of Swine.

The Department of Agriculture and Stock is operating a scheme whereby pig herds are tested at intervals for the occurrence of swine brucellosis (contagious abortion).

A herd listed by the Department as "brucellosis tested" is one in which all such animals as may be determined by the Director of the Department's Division of Animal Industry have been subjected to two successive tests for brucellosis, at intervals determined by him, without any positive reactors being found.

In order for a herd to be retained on the list of Tested Herds, a semi-annual or annual re-test of the herd, as determined by the Director, is required. If at a re-test any animal gives a positive reaction to the test the herd is removed from the list; it is not listed again until subsequent tests, as determined by the Director, have been carried out.

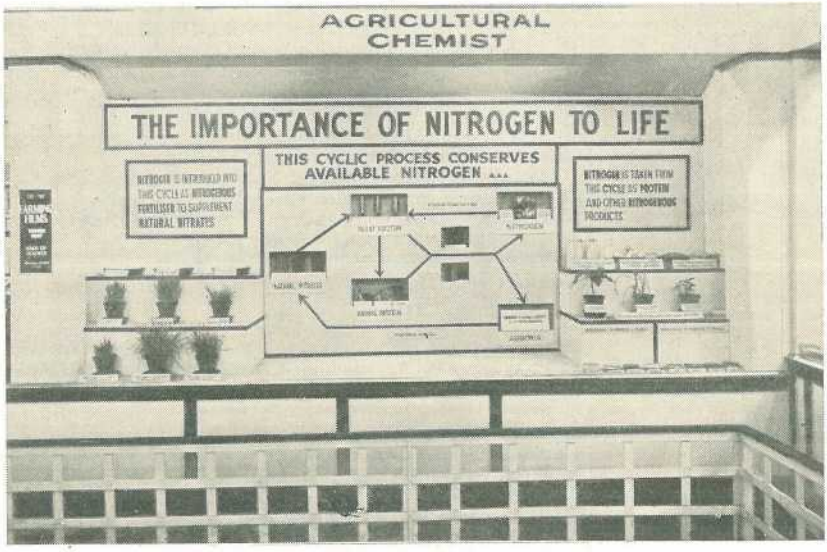
Full particulars of the Brucellosis Testing of Swine and application forms may be obtained from the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.

TESTED HERDS.
(AS AT 20th AUGUST, 1951.)

Breed.	Owner's Name and Address of Stud.
Berkshire	S. S. Ashton, " Scotia " Stud, Pittsworth
	J. J. Bailey, " Lucydale " Stud, East Greenmount
	S. Cochrane, " Stanroy " Stud, Felton
	Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
	G. Handley, " Handleigh " Stud, Murphy's Creek
	J. L. Handley, " Meadow Vale " Stud, Lockyer
	R. G. Koplick, " Melan Terez " Stud, Rochedale
	H. V. Littleton, " Wongalea " Stud, Crow's Nest
	O'Brien and Hickey, " Kildurham " Stud, Jandowae East
	E. Pukallus, " Plainby " Stud, Crow's Nest
	G. C. Traves, " Wynwood " Stud, Oakey
	E. Tumbridge, " Bidwell " Stud, Oakey
	Westbrook Farm Home for Boys, Westbrook
	H. W. Wyatte, Rocky Creek, Yarraman
	H. M. State Farm, " Palen Creek," Palen Creek
	A. R. Ludwig and Sons, " Cryna " Stud, Beaudesert
	H. H. Sellars, " Tabooba " Stud, Beaudesert
	F. Thomas, " Rosevale " Stud, Beaudesert
	Bowkett and Meacle, " Myola Vale " Stud Piggery, Burra Burri, Jandowae
	D. T. Law, Trouts Road, Aspley
	R. J. McCullough, " Maxholm " Berkshire Stud, Gatton
	C. F. W. and B. A. Schellback, " Redvilla " Stud, Kingaroy
	R. H. Crawley, " Rockthorpe " Stud, *via* Pittsworth
Large White	H. J. Franke and Sons, " Delvue " Stud, Cawdor
	Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
	F. L. Hayward, " Curyo," Jandowae
	J. A. Heading, " Highfields," Murgon
	K. B. Jones, " Cefn " Stud, Pilton
	R. G. Koplick, " Melan Terez " Stud, Rochedale
	R. Postle, " Yaralla " Stud. Pittsworth
	E. J. Bell, " Dorne " Stud, Chinchilla
	M. E. Myers, Halpine Plantation, Kallangur
	L. C. Lobegeiger, " Bremer Valley " Stud, Moorang, *via* Rosewood
	J. H. G. Blakeney, " Talgai " Stud, Clifton
	V. P. McGoldrick, " Fairymeadow " Stud, Cooroy

TESTED HERDS—continued.

Breed.	Owner's Name and Address of Stud.
Tamworth	S. Kanowski, "Miecho" Stud, Pinelands N. R. Potter, "Actonvale" Stud, Wellcamp D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun A. C. Fletcher, "Myola" Stud, Jimbour L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood P. V. Campbell, Lawn Hill, Lamington Salvation Army Home for Boys, Riverview F. Thomas, "Rosevale" Stud, Beaudesert A. J. Surman, Noble Road, Goodna P. V. McKewin, "Wattleglen" Stud, Goombungee
Wessex Saddleback ..	W. S. Douglas, "Greylight" Stud, Goombungee K. Day and P. Hunting, "Kazan" Stud, Goodna E. Sirrett, "Iona Vale" Stud, Kuraby C. R. Smith, "Belton Park" Stud, Nara H. H. Sellars, "Tabooba" Stud, Beaudesert H. Thomas, "Eurara" Stud, Beaudesert D. T. Law, Trouts Road, Aspley G. J. Wilson, "Glenbella" Stud, Silverleigh G. J. Cooper, "Cedar Glen," Yarraman



The Cycle of Nitrogen in Nature Was Traced by Flashing Lights in this Display of the Chemical Laboratory.

ASTRONOMICAL DATA FOR QUEENSLAND.

OCTOBER.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5·29	5·47	Cairns ..	36	22	Longreach	38	31
6	5·23	5·49	Charleville ..	28	26	Quilpie	34	36
11	5·18	5·52	Cloncurry	55	45	Rockhampton ..	13	7
16	5·13	5·55	Cunnamulla ..	29	30	Roma	18	16
21	5·07	5·58	Dirranbandi ..	18	20	Townsville ..	30	19
26	5·03	6·01	Emerald	22	16	Winton	44	36
31	5·00	6·04	Hughenden ..	40	30	Warwick	3	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	a.m.	p.m.
1	5·16	5·59
2	5·48	7·00
3	6·22	8·04
4	7·02	9·11
5	7·48	10·19
6	8·42	11·25
7	9·42	..
		a.m.
8	10·48	12·25
9	11·56	1·19
	p.m.	
10	1·03	2·06
11	2·09	2·46
12	3·11	3·21
13	4·12	3·53
14	5·11	4·25
15	6·11	4·56
16	7·11	5·29
17	8·10	6·05
18	9·09	6·45
19	10·06	7·29
20	10·59	8·17
21	11·47	9·10
22	..	10·05
	a.m.	
23	12·30	11·01
24	1·08	11·57
		p.m.
25	1·42	12·53
26	2·14	1·49
27	2·44	2·46
28	3·14	3·43
29	3·45	4·44
30	4·18	5·48
31	4·57	6·55

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27 ; Cunnamulla 29 ; Dirranbandi 19 ;
Quilpie 35 ; Roma 17 ; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	20	16	36	32	11	8	42	36
6	30	9	46	23	21	0	54	26
11	24	13	40	29	15	3	46	32
16	13	25	28	41	3	16	31	48
21	9	30	25	45	0	21	26	54
26	14	23	30	39	5	14	34	44
31	26	12	43	26	18	1	50	29

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	32	23	52	45	36	30	26	20
3	43	11	60	38	45	23	36	11
5	53	3	67	32	50	18	44	4
7	56	3	68	32	52	18	46	4
9	52	5	66	34	50	20	43	6
11	41	14	57	40	42	25	34	14
13	29	31	50	52	35	37	25	27
15	18	38	42	56	27	41	16	33
17	8	48	36	62	21	48	8	40
19	2	55	33	67	17	52	3	45
21	3	56	34	67	18	53	4	46
23	6	50	35	63	20	49	6	42
25	14	42	39	59	24	44	13	36
27	24	31	46	52	31	37	21	27
29	35	20	54	44	39	29	29	18
31	46	8	62	36	47	21	38	8

Phases of the Moon.—New Moon, October 1st, 11.57 a.m.; First Quarter, October 8th, 10.00 a.m.; Full Moon, October 15th, 10.51 a.m.; Last Quarter, October 23rd, 9.55 a.m.; New Moon, October 30th, 11.54 p.m.

On October 15th the sun will rise and set about 10 degrees south of true east and true west respectively, and on the 13th and 28th the moon will rise at true east.

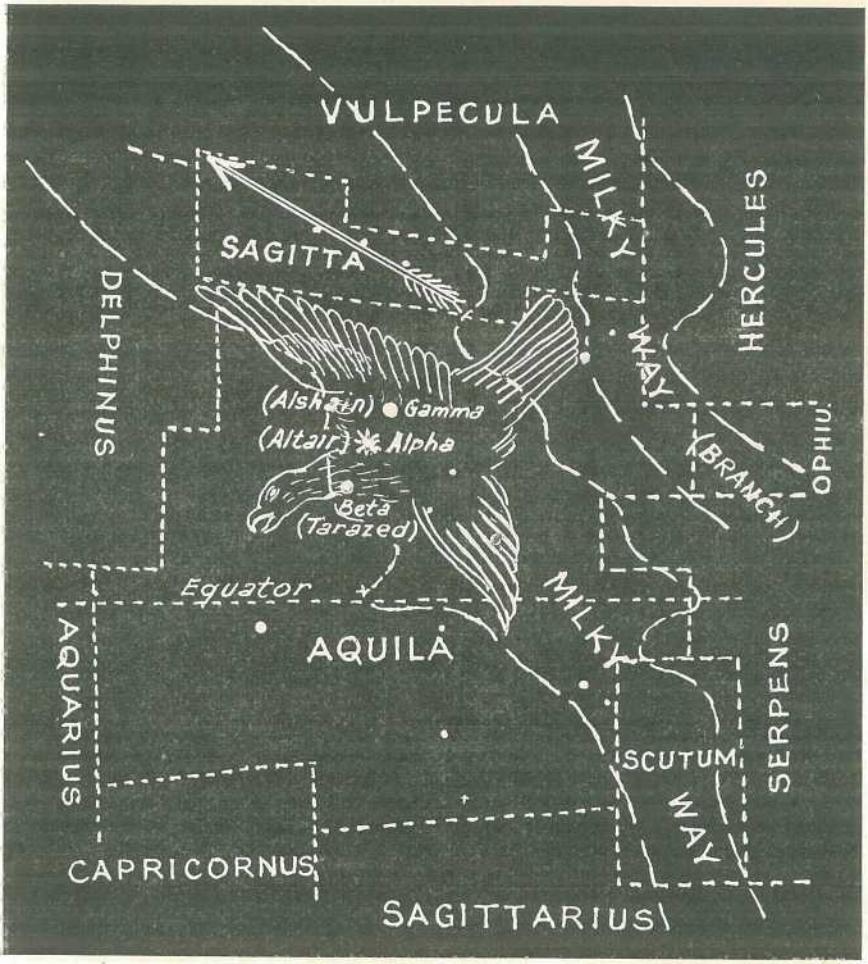
Mercury.—At the beginning of the month, in the constellation of Leo, will rise 20 minutes before the sun. After the 13th it will pass into the evening sky and by the end of the month, in the constellation of Libra, will set 50 minutes after sunset.

Venus.—Now a conspicuous object in the eastern morning sky, rising 2 hours before the sun at the beginning of October and reaching greatest brilliancy on the 10th. By the end of the month it will rise 2¼ hours before the sun.

Mars.—Not far from Venus but much fainter than that planet and higher above the horizon. It will rise 2 hours 10 minutes before the sun on the 1st and on the 3rd will pass close to the star Regulus in the constellation of Leo. On the 27th the moon will pass between Mars and Venus, Mars being on the north and Venus on the south. At the end of the month Mars will rise 2 hours 24 minutes before sunrise.

Jupiter.—In the constellation of Pisces, at the beginning of the month will rise just before sunset and will be seen the whole night. By the end of the month it will rise during the afternoon daylight hours and set about 1¾ hours before sunrise.

Saturn.—Too close in line with the sun to be seen at the beginning of October, but by the end of the month will rise 1¼ hours before the sun.



THE CONSTELLATIONS.

AQUILA, SCUTUM AND SAGITTA.

Adjoining Ophiuchus and Serpens, north of the Equator, is the constellation of Aquila (the Eagle), said to represent the eagle sent by Jupiter to bring Ganymede to be cup bearer to the gods on Mount Olympus. Much of the constellation lies in the Milky Way and the brightest star, Altair, is a very fine first magnitude white star flanked on opposite sides by fainter stars, Beta and Gamma, the group making a pattern something like the stars of Orion's "belt." About 15 degrees west and 8 degrees south of Altair there appeared a very bright nova in 1918. It reached a maximum brightness of —1.4 magnitude (almost as bright as Sirius) and was the brightest nova recorded since Kepler's nova of 1604. About six months after this nova outburst, a faint greenish gaseous envelope could be seen in the telescope. Since then this "shell" has been expanding at the rate of about 2 seconds of arc per year.

Though this region of the sky is very rich in double stars, variables, nebulae, &c., there are no particularly bright stars, except Altair, from the South Pole regions to well down on the northern horizon and from Ophiuchus eastward to the "Great Square" of Pegasus. Standing out so bright against the background of fainter objects, Altair and thus Aquila are easily identified.

Bordering Aquila and situated between Serpens and Sagittarius is the small modern constellation of Scutum (the Shield) lying almost entirely in the Milky Way in the region of its greatest density of stars. The constellation was made by Hevelius late in the seventeenth century. Photographs of this area clearly show the many star clouds and on pictures 12 inches by 12 inches more than 2,000,000 stars are recorded. Being of modern origin, there is no recognized symbol.

On the north of Aquila is the faint constellation of Sagitta (the arrow), previously called Alahance. The Milky Way also traverses this group and consequently many interesting telescopic objects are to be found there.